

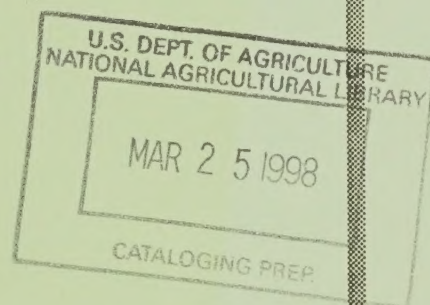
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Social Science Agricultural Agenda Project

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Phase II Workshop



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COMMISSIONED PAPERS FOR THE
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TABLE OF CONTENTS

	<u>Page</u>
ADAMS, Dale W. On-Farm Capital Formation and Rural Financial Markets: Research Issues	1-i
BROMLEY, Daniel W. Economic Institutions and the Development Problem: History and Prognosis	2-1
CHURCHMAN, C. West On Agricultural Decision Making: Private or Public	3-i
DeWALT, Billie R. Anthropology, Evolution, and Agriculture	4-1
FLORA, Cornelia Butler Studies of Households Reviewed in Relation to Farm and Home, Balanced Farming, Farming Systems and Farm Management Programs and Studies in the College of Agriculture	5-1
FORTMANN, Louise P., Daniel C. Muntjoy and Bruce F. Johnston People, Processes, and Products: Potential Contribution of the Social Sciences to the Preservation and Enhancement of Natural Resources in Third World Countries	6-1
FOX, Karl A. Progress and Advances Needed in Social Indicator Research of Potential Value in Researching Rural Issues and Problems	7-1
HANEY, Waiva -- NOT AVAILABLE AT TIME OF ASSEMBLY Theoretical Advances Arising from Studies of the Roles of Women in Agriculture that Have Potential Widespread Usefulness for Agriculture	8-1
HOBEN, Allan -- NOT AVAILABLE AT TIME OF ASSEMBLY Improving the Administration of the Social Sciences in International Donor Agencies Including AID	9-1
HUFFMAN, Wallace E. Contributions of Social Sciences to Augmentation of Human Capital for General Economic Growth	10A-1

	<u>Page</u>
JOHNSON, Glenn L. The Urgency of Institutional Changes for LDC, NIC and DC Agricultures	10B-1
JOSLING, Tim The Relationship Between International Rural Development and International Trade and Finance	11-i
LIPTON, Michael -- NOT AVAILABLE AT TIME OF ASSEMBLY Social Science Roles in Meeting the Needs of International Donors for the Assessment of Agricultural Technologies	12-1
McCLENNEN, Edward F. Utility, Utilitarianism and Public Policy	13-1
REYNOLDS, Clark W. Agricultural Sector Analysis and Rural Development: Social Science Research Priorities	14-1
RUTTAN, Vernon W. The Role of the Social Sciences in the Generation, Dissemination and Evaluation of Institutional Change	15-1
STAATZ, John M. Designing Social Science Research to Inform Agricultural Market Reforms and Structural Adjustments in Developing Countries	16-i
THOMPSON, Paul Potential Social Science Contributions to the Resolution of Conflicts Between U.S. Commodity Groups and AID with Respect to Technical Assistance for Foreign Agriculture	17-1
WEBER, Michael T. and Thomas S. Jayne Food Security and Its Relationship to Technology, Institutions, Policies and Human Capital	18-1

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ON-FARM CAPITAL FORMATION AND RURAL
FINANCIAL MARKETS: RESEARCH ISSUES

by

Dale W Adams

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On-Farm Capital Formation and Rural
Financial Markets: Research Issues

by
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The past 30 years the pace of agricultural growth in many low income countries (LICs) has been remarkable. While a few nations continue to have trouble feeding all their citizens when disaster strikes, and some people lack access to sufficient calories, there are now fewer production dilemmas and more problems of inequitable distributions of purchasing power. Social scientists have contributed to this success by helping policy makers understand the importance of product and input prices, new production technology, education, and infrastructure in agricultural growth.

Several important contributors to rural development, namely on-farm capital formation and rural financial markets, nevertheless, are still poorly understood. This is largely due to the difficulties of documenting their contributions to development. While highly visible government investments in agriculture are important, especially in relatively high income countries, progress in agriculture has often depended on capital formation that occurs outside the spotlight, done in small increments by individuals or by small groups of farmers. Likewise, rural financial intermediation is difficult to document because it is usually diffused and fragmented, includes a large number of participants, and involves procedures that are misunderstood.

In the following discussion I outline research priorities on the topics of on-farm capital formation and rural financial markets. Before doing this, I clarify my use of the terms 'capital' and 'rural financial markets,' briefly describe the intersections between these markets and on-farm capital formation, and present terse summaries of recent research on these topics.

Definitions

There are few areas in economics that involve more ambiguities than capital, largely because of the elastic definitions employed. On occasions the term capital is applied to things as disparate as money, a category of productive inputs, education and experience, and social relationships. In the following discussion I restrict my use of the term to inputs that are not entirely expended in one production period and are man-made, or grow only under husbandry. Examples include the terraced rice paddies and associated irrigation systems in many parts of Asia constructed with huge investments of human labor. Similar capital creation can be seen in Belize or Peru where colonists are attacking jungles with axe and fire to prepare land for crops or livestock. The extensive cattle herds of the Maasai in East Africa, water buffalo in Thailand, tea plantations in Sri Lanka, coca fields in Bolivia, fruit orchards in Chile, olive groves in Jordan, cocoa trees in Ghana, coconut plantations in Jamaica, rubber plantations in Malaysia, and coffee groves in Costa Rica are other examples of farm capital, mostly created by sweat-equity.

The ancient and modern irrigation systems along the Nile remind us that this capital formation has occurred for thousands of years. The hoes used by farmers in Niger, the machetes wielded by Colombian farmers, the chain saws employed by Ecuadorian colonists, and cactus fences planted by Mexican farmers illustrate that capital may come in small and, sometimes, unglamorous forms.

I also employ a narrow definition when discussing rural financial markets (RFMs). I use this term to denote transactions in rural areas that involve loans or deposits, done at least partly with financial instruments. While my main concern is with how formal and informal intermediaries help to facilitate finance, I am also interested in how individuals or small groups mobilize funds and make loans to each other without intermediaries.

I make a careful distinction between man-made capital and financial instruments (generalized claims on resources). In the sense I use these terms, only capital contributes directly to production. Funds or financial instruments, in turn, do not enter production directly, but may be used to purchase capital or non-capital inputs, held as assets, or converted into other assets or consumption goods. It is important to note that capital may play dual roles in a farm household; not only are these items gradually used up in production, but until they are worn out they are also assets. It is only in this latter sense of being an asset that financial instruments and capital items are similar.

Another way of distinguishing between capital and financial instruments is by the transactions costs involved in converting

them into something else. Typically, changing financial instruments into other forms involves few costs--low transactions costs are the major reason for the invention of money. In contrast, the transactions costs of converting capital items into other forms are typically relatively large. Also, the divergence between salvage value of most capital items and their use value deter decisions to covert capital items into other goods or services.

Intersections

There are major overlaps between on-farm capital formation and RFMs. Loans allow farmers to purchase large capital items sooner than they could have done if they had to save sufficient funds to make the purchase. Also, firms that can borrow to cover part of their operating costs may realize higher incomes, that, in turn, facilitate on-farm capital formation more rapidly than if loans were unavailable. Deposit services may also enhance capital formation by providing households places to store savings increments until the firm has enough money to purchase a large capital item. Further, the ability to borrow may allow firms to undertake larger and more risky on-farm investments than operators would deem prudent in the absence of credit reserves (Baker).

On a more aggregate scale, efficient financial markets facilitate capital formation in rural areas through helping to allocate resources more efficiently; surplus operators who expect low marginal rates of return to investments in their operations can make deposits with financial intermediaries, who, in turn, can

lend these funds to individuals who expect high returns from further investments, but have too little cash to act on these opportunities. The more efficient allocation of resources that results increases incomes of both saver and borrower and thus enhances their abilities and incentives to make further investments.

While financial markets play a significant role in on-farm capital formation where farmers buy and sell a large part of their inputs and products, it is important to remember that self-finance often dominates on-farm capital formation. This is especially true when RFMs are rudimentary and where these markets are severely repressed. It is too often forgotten that humans have made immense investments in irrigation systems, clearing of land, in livestock, in terracing, in buildings, and in equipment without the assistance of formal financial systems and government credit programs.

Before leaving this topic, it is useful to briefly critique a spurious intersection between farm capital and RFMs: the claim that a low interest rate on formal loans induces farmers to substitute capital (machinery) for labor. While often mentioned in development literature as the main adverse effect of cheap agricultural loans, on careful analysis this appears not to be the case for two reasons.

First, most farmers in LICs operate in fragmented financial markets that have real interest rates on loans ranging from highly negative to highly positive. There is no a priori reason to

conclude that one of these interest rates--the concessionary rate charged on a formal loan--dictates the subjective discount rate applied by the borrower to the future stream of benefits expected from an investment in machinery. (If this were true, it would imply that high interest rates cause farmers to substitute labor for capital). Even if there were a one-to-one relationship between an interest rate on a loan and a borrowers' subjective discount rate, what discount rate would an individual use who has two loans, one with a low interest rate and the other a high rate? One answer is that, in fragmented financial markets especially, interest rates on individual loans have no direct tie to a borrower's subjective discount rate.

Second, financial instruments are highly fungible (interchangeable); a borrowed unit of currency is identical to one owned by the borrower. Further, almost all farmers in LICs have multiple sources and uses of liquidity. Thus, one should not conclude that marginal changes in use of borrowed liquidity are highly correlated with the justification given for the loan. Most borrowers have the option of exercising financial substitution, even if the intent of a loan is to buy machinery. Part of this substitution may involve hiring more labor. Given this, it is not clear why a change in the price of one source of liquidity--the interest rate on a formal loan--would alter the relative desirability of two possible uses of liquidity: e.g., purchasing machinery compared to hiring more labor. Interest rates have no direct effect on the marginal returns expected from labor or

capital and, therefore, have little or no direct effect on factor-use proportions by borrowers.

If concessionary interest rates on formal loans affect factor-use proportions, it is more likely an indirect relationship. That is, low interest rates induce lenders to concentrate loans in the hands of borrowers who have the most secure collateral and those who impose the lowest transactions costs on the intermediary (Gonzalez-Vega). If these preferred borrowers happen to use a higher ratio of capital-to-labor than do those potential borrowers rationed from the market by the low interest rates, then the overall ratio of capital-to-labor will increase.

Research on Capital Formation

Farm capital is difficult to analyze for at least five reasons. First, complications are encountered because capital items are heterogeneous and difficult to value. This causes serious aggregation problems. What value does the researcher assign to a capital item that can only be sold for less than its acquisition price, but is worth more for production purposes than its salvage value? Second, some capital items such as housing and vehicles are used both for production and consumption. Third, some capital formation occurs in qualitative changes. How does a researcher measure and evaluate changes in soil productivity enhanced through drainage, fertility improvements, weed control programs, or removal of stones? How should changes in human capital be measured when they occur largely through experience

gained from trial and error? Fourth, when is a capital item held by the farm operator because it is a desirable asset, rather than because of its direct contribution to production? And fifth, how can the researcher keep the costs of collecting data within reasonable bounds when farmers are often reticent--or unable--to reveal a complete inventory of their capital and assets, and when study of capital formation is best done with costly time series information or panel data?

These problems have dissuaded most researchers, in both high as well as low income countries, from doing comprehensive studies of this topic. Exceptions to this are extensive farm surveys carried out by Brazilian and US academics during the early 1970s in Southern Brazil (Adams and others), a handful of case studies by anthropologists (e.g., Firth and Yamey), and interesting work by agricultural economists in Japan (e.g., Izumida).

It has been more common for researchers to do partial analyses of single types of farm capital such as machinery, irrigations systems, human capital, livestock, perennial crops, buildings, and land quality changes. Also, it has been more common for researchers to do cross sectional studies and treat capital generation as an event, rather than to collect time series or panel data that would allow analysis of the process of capital formation. Because of the lack of data, researchers have often been forced to study the contribution of capital and technological change by looking at unexplained residuals.

Research Agenda on Capital Formation

While the make up of farm level capital, how it evolves over time, and the contributions it makes to overall development are interesting intellectual questions, answering these questions exceeds the patience and resources available to most researchers, especially in LICs. Researchers will be forced to continue to limit their analysis in this area to partial studies that are most interesting to policy makers. If it is important to demonstrate that substantial amounts of on-farm capital formation occur, and to show that it makes an important contribution to development, representative case studies may be more realistic research tools than are large surveys. While not satisfying intellectually, those who are interested in the overall process of on-farm capital formation must accept this process as largely taking place in a black box.

Instead of attempting to measure on-farm capital formation or to document its contribution to development, researchers will be forced to focus on how to speed investments in particular capital items and assessing whether it is desirable to do so. This will include documenting the impact of important economic policies on these investments. The bulk of the research, therefore, will be on some particular capital form and on particular conditions or policies that affect these investments by farmers.

The capital forms that receive priority in a given country will be highly time and place specific. For example, in the late 1960s and early 1970s tubewell irrigation in many parts of South

Asia was an important part of capital formation and merited substantial research. In contrast, in the late 1980s the Peoples' Republic of China was making major decisions on farm mechanization, considerations that could have benefited from systematic analysis. Still other countries such as Haiti, many nations in Africa, and Nepal need to encourage more on-farm investments to slow the ravages of erosion; research might provide assistance in making these decisions.

Because of the possibilities of labor substitution as well as complementarities, farm machinery will likely be a high priority research item in many LICs. It is also clear that improvement in, and extension of, irrigation systems will be necessary to sustain growth in agricultural output in many countries. Likewise, investments in conservation practices will be necessary in almost all LICs if our generation is to pass on to the next land and water resources that sustain rather than hobble development. Many farmers will also need to expand their livestock herds, plant more tree crops, and learn modern farming practices if those who people the 21st Century are to be fed and clothed better than those of the 20th Century.

It is easier to identify the conditions and policies that merit research priority when it comes to stimulating on-farm capital formation. On a broad scale it is largely the ability and willingness of farmers to make farm investments that determine the pace of farm level capital formation. Ability to invest is strongly influenced by farmers' income, ability to borrow funds or

resources, and education and experience. The willingness to invest, in turn, is largely conditioned by the returns farmers expect from additional investments in on-farm capital. Expected prices of products and inputs, yield expectations, risk considerations, and subjective discount rates applied to the expected benefits from the investment are additional considerations. Insecure land title and tenure can also have a major impact on the willingness of farm operators to make investments. Where this is a problem it merits special research attention.

As suggested earlier, RFMs facilitate on-farm capital formation and in many countries credit projects are the major instrument used by governments and donors to stimulate investments in machinery, tree crops, livestock, irrigation, conservation, buildings, and even education. Credit projects are frequently accompanied by sizeable subsidies through concessionary interest rates, capital grants, toleration of loan defaults, and free training. Recent research has shown that many of these projects have not worked as intended, that formal RFMs are not efficient, and that they are distributing their services and subsidies inequitably. It has become increasingly clear that RFMs can only bolster development in general, and on-farm capital formation in particular, if they operate more efficiently and equitably, a subject to which I now turn.

Research on RFMs

RFMs in low income countries have increasingly drawn the attention of researchers, especially since the late 1960s. Even prior to that, a few substantial studies were done on the structure of rural credit markets, especially in Asia. Increased RFM research resulted from large government- and donor-sponsored farm credit programs initiated during the 1960s-1970s, attempts to create new farm credit organizations, and from efforts to substitute formal loans for informal borrowing. In some countries, farm loans became the main tool for promoting rural development. These programs were usually targeted at accelerating the use of modern technology and increasing on-capital formation. Much of the research associated with these efforts was either in the form of credit-impact studies aimed at documenting borrowers' benefits from expanded loan use, or studies to uncover exploitation by informal lenders.

By the early 1970s it became clear that many of these credit programs had serious problems and that much of the research done was of limited use in forming solutions. This was documented in a worldwide review of small farmer credit programs conducted by the Agency for International Development during 1972-73 (Donald), and reinforced by an FAO sponsored conference in Rome on agricultural credit in 1975. Major problems included extensive loan defaults, concentration of concessionary priced loans in the hands of borrowers who were relatively well off, few rural people with access to formal financial services, credit programs that were not

self sustaining, few deposits mobilized in rural areas, and growing doubts about how effective loans were in stimulating investments and output.

During the 1970s, research on RFMs began to evolve from credit-impact studies and attempts to document exploitation by informal lenders, to paying more attention to the overall performance of RFMs, positive aspects of informal finance, and deposit mobilization. This involved a change in the focus of research from what farmers did with additional funds provided by a loan, to understanding the behavior and services provided by financial intermediaries. These research trends continued during the 1980s, but additional stress was also placed on the transactions costs involved in various aspects of rural financial intermediation.

RFM Research Agenda

Policy makers and researchers who specialize in RFMs have somewhat different concerns. The policy maker tends to worry about immediate problems; while interests of researchers are longer run, more basic in nature, and revolve around understanding how RFMs work. A research agenda that addresses some of the policy makers concerns (so they will fund the research), and, at the same time, also furthers the interests of researchers might be done best through the use of a research matrix.

Because financial markets are interwoven, it is important that this matrix reflect the most important aspects of these markets, of which there are at least three. The first dimension

is made up of the three layers of participants in RFMs: individual borrowers and savers, financial intermediaries, and policy makers. The second dimension divides financial activities into those carried out by formal intermediaries (regulated) and those conducted in informal markets (unregulated). The third dimension further subdivides the above into loan and deposit issues.

This matrix recognizes the intimate relationship between policy, intermediary behavior, and financial services. Likewise, it acknowledge that formal and informal finance are entwined, and that deposits and loans are often mirror images of each other.. The matrix also encourages researchers to view RFMs as linked parts, rather than as a series of independent credit projects. It further highlight the importance of considering deposit mobilization along with lending.

Placing previous research into this matrix allows identification of gaps in analysis. For example, prior to 1970 most RFM research focused on the borrower-saver dimension, with some analysis on intermediaries, but largely ignored deposits. During the 1970s more research emphasis was given to the policy making dimension and to deposits. In the 1980s informal finance and research on intermediary behavior and performance has receive much more attention, along with study of the performance of the overall system.

RFM problems and policies in many LICs are surprisingly similar. This results in a relatively small number of research issues that are of interest to a large number of policy makers as

well as researchers. Five candidates for this list are: (1) Documenting the transactions costs involved in RFMs and their distribution among the participants in these markets. This includes studying how new financial technologies and changes in policies affect these costs. (2) Explaining why some rural people have access to formal loans and deposits while others do not. (3) Understanding what causes formal loan recovery problems. (4) Studying how deposit mobilization affects the performance of RFMs. And, (5) analyzing the financial services provided by various forms of informal finance in order to design more desirable formal financial systems. A few additional comments on each of these topics may show why they are likely to be of interest to both policy makers and researchers.

Transactions costs show the amount of financial friction in RFMs and are, perhaps, the best measure of the overall efficiency of a financial system. Studying the allocation of these costs among participants also provides insights into how financial services are rationed. Currently, some students of RFMs are arguing that major reductions in these costs will be necessary before formal financial markets can service--on a sustained basis--many of the rural people who now do not have access to formal loans or deposit accounts. Systematic study of transactions costs can give policy makers and managers of financial institutions useful insights into the costs of their program and projects, and at the same time, allow researchers to gain fundamental insights into the operations of RFMs. Transactions costs for a doctor of

financial systems are analogous to the blood pressure taken by a physician as a measure of a person's health. Each measure tells a lot about the general health of a patient, be they a person or an RFM.

The proportion of rural individuals and firms who can borrow from, or deposit surpluses in, a formal institution is an excellent proxy for the extent to which RFMs assist in allocating resources efficiently. A repressed or underdeveloped financial system reaches only a few of the individuals who can productively use formal loans. A severely repressed financial system does a particularly poor job of connecting surplus households and firms to a system that facilitates resource reallocation. Increasing the number of rural people, especially the poor, who have access to formal loans is a primary policy objective in many LICs. Clarifying why financial markets are slow to embrace new customers in rural areas provides fundamental insights into how these markets operate and also has important short-run policy implications.

Defaults on agricultural loans made from government or donor funds are a major concern of policy makers in a number of LICs. Chronic defaults drain government budgets and also undermine the ability to sustain government sponsored credit programs. In a fundamental sense, loan recovery reflects the quality of the relationships between borrowers and lenders. Chronic recovery problems indicate an inability on the part of the lender to verify creditworthiness, that politics are heavily involved, or that

borrowers find their relationships with lenders are unsatisfactory and decide to seek a "divorce" through the expediency of default. Even worse, defaults destroy one of the most important products of financial intermediation: sustained working relationships between borrowers and intermediaries.

The past few years an increasing number of governments have been unable to sustain previous levels of funding for agricultural credit programs. This problem has been reinforced by the declining willingness of donors to provide loans for government credit efforts. This has forced some government institutions to place more emphasis on mobilizing deposits in rural areas. At the same time, a few researchers have been arguing that RFMs would operate more efficiently and equitably if their deposit-to-loan ratios were increased substantially. This ratio shows the extent to which RFMs are self funded, or conversely, the extent to which they are dependent on outside funds. Outside funds may impose substantial additional costs on RFMs, open them to political intrusions, and seduce them into ignoring deposits. RFMs that have high loan-to-deposit ratios appear to perform better with respect to transactions costs, loan recovery, and proportion of rural population serviced than do those systems with low ratios.

As suggested earlier, policy makers have traditionally been interested in informal finance only in a perverse way of seeking its demise, particularly in South Asia. Recent research, however, is suggesting that some forms of informal finance in rural areas provide financial services efficiently. Also, some rural people,

especially the poor, find that informal financial services are more valuable to them than are government sponsored programs. The popularity of informal finance in rural areas and high rates of loan recovery in these systems are signs of this. Analysis of informal finance can provide valuable information on the types of financial services that many people are demanding, along with insights into arrangements and technologies that people informally develop to keep the costs low of providing these services.

Concluding Comments

Farm level capital formation and rural financial markets in LICs are some of the most difficult research topics that social scientists treat. Both processes occur over wide geographic areas, include a large number of participants, and involve activities that are costly and tedious to substantiate. These research problems are exacerbated by fuzzy thinking about what capital is and what financial markets do. While these two sets of activities do intersect, they are vastly different processes and ought to be treated that way by researchers.

It will be extremely difficult to document the overall contribution of farm-level capital formation to development. In addition, few policy makers are willing to pay for this type of research. Those who are interested in this process must gain insights into it through case studies and through analyses of those types of capital that policy makers are attempting to promote.

Opportunities for doing useful research on RFMs are more promising. Additional analysis should focus on understanding why RFMs operate inefficiently and also limit their services to such a small part of the population. Because politics is often involved in credit programs, those doing RFM research must be sensitive to the risks and opportunities this entails.

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ECONOMIC INSTITUTIONS AND THE DEVELOPMENT PROBLEM:

HISTORY AND PROGNOSIS

Daniel W. Bromley *

I have been asked to present a perspective on agricultural history and the changing structural dimension of agriculture in both the industrialized countries and in the agrarian societies that are, euphemistically, called "less developed." More specifically, I was asked to explore the strengths and weaknesses of the transaction cost/institutional economics interpretation of these matters. I will approach the assignment by offering my particular view of institutions and transaction costs to explain observed socioeconomic phenomena in the industrialized and agrarian nations. Space limitations preclude a meaningful discussion of the strengths and weaknesses of the approach I will propose and so that must be left to the reader. My presumption is that the perspective being offered can be helpful in suggesting important modifications in the way that social scientists address questions of economic and social change.

I will first describe, very briefly, the concepts of institutions and transaction costs. I will then describe what I regard to be the policy crisis in agriculture in both the industrialized as well as the agrarian nations of the world. I will close with some implications for social scientists who may wish to play an important role in research and public policy in these two arenas.

Institutions and Transaction Costs

Institutions represent the constellation of rights and duties that determine domains of choice for individual members of society. These institutions may be regarded as conventions or they may be regarded as entitlements (Bromley 1988). Sociologists are interested in institutions as they define roles and status. Economists are interested in institutions as they define property rights, contract, the "market", and non-market exchange. Note that institutions are the rules by which organizations function and interrelate; institutions are not properly regarded as those organizations.¹

The properly orthodox economist seems to show very little curiosity about institutions, nor about the formation of individual tastes and preferences, regarding both as exogenous factors to be pondered by the political scientist

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¹ Some writers use the term "institution" to denote both rules as well as organizations (banks, hospitals, and universities are called institutions). This confusion stands in the way of a meaningful analysis of the role of institutions in defining transaction costs, and in explaining individual and aggregate behavior.

and the psychologist, respectively. With those tastes and preferences given, most economists are much more interested in predicting individual and aggregate behavior under the behavioral assumption of utility maximization. My perspective, on the other hand, is to argue that there are two levels of tastes and preferences of pertinence to the social scientist. The first level will pertain to the institutional arrangements that define choice domains, while the second level will pertain to tastes and preferences for actions selected from within those prespecified choice domains. Individuals have preferences over choices to be made at both levels. An interest in institutions would suggest that the social scientist ought to study both levels of preferences and choices.² I will later argue that the political-economic context of agriculture is better understood as a product of this two-part process of preference revelation.

Institutions, as the working rules of going concerns (families, firms, nations), define what is a cost, and to whom. If the institutional arrangements are permissive of widespread pesticide use then those who experience detrimental effects arising from the use of pesticides are made to suffer these costs in silence. If those adversely affected by pesticide use wish to seek redress or a change in the rules then they must bear the bulk of the costs of accomplishing that change. The victims are forced by the legal environment (the institutional arrangements) to bear the unwanted costs of their situation, or to undertake the expensive process of institutional change. The party imposing the unwanted costs will be able to continue until the adversely affected party has been able to mobilize sufficient political support to bring about a change in the institutions. Hence, institutions indicate who must bear the costs of existing economic activity, and they indicate who must bear the transaction costs of changing those very institutional arrangements (Bromley 1988; Schmid).

By transaction costs I mean the costs of obtaining information about a particular economic situation. Additionally, transaction costs include the actual cost of negotiating a particular exchange. Finally, transaction costs include the costs of enforcing the terms of an exchange once it has been consummated. Transaction costs can pertain to the normal exchange that might occur between two individuals, or they can pertain to the necessary costs of changing the existing institutional arrangements.

It will be useful to consider three domains of individual behavior that ought to interest the social scientist concerned with economizing activity. Call these the domain of reproduction, the domain of production, and the domain of exchange. I will illustrate the way in which these three domains are interconnected in the life of the individual farmer. More importantly, I will show that it is the institutional arrangements which provide that connective tissue, and it is therefore to institutions and their derivative transaction costs that the social scientist must look for an understanding of individual behavior. One cannot understand family size or composition, productive activities, or exchange activities, let alone the interrelations among them, without understanding institutions. An understanding of

² It should not be assumed that the same models that are used so successfully for the second level maximization problem are appropriate for choices at the first level. See Field.

agricultural history--and prognosis for the future--is equally dependent upon an apprehension of the concept of institutions.

To repeat, institutions determine the choice environment within which individuals and groups will make daily decisions regarding their behavior. The basic activity of the family is to reproduce itself--this is the domain of reproduction. Equally important is to produce the necessities for survival--this is the domain of production. Finally, there is the opportunity for exchange with other social units (individuals, families, clans); this is the domain of exchange. The institutional arrangements in a society will influence behavior within each of these domains, and also will define the sanctions and incentives that transmit signals among domains so that outcomes in the domain of exchange will influence behavior and outcomes in the domain of production, and ultimately in the domain of reproduction.

Policy Crises in Agriculture

The intent of the SSAAP is to enhance the quality and effectiveness of research and related activities in the rural social sciences and in their related basic social science disciplines. The success of this effort will hinge on how clearly we define the basic problem in the agricultural sectors of both the industrial and the agrarian nations of the world. I suggest that the policy crisis in agriculture in both the industrialized nations, and in the agrarian nations, can be understood with the aid of concepts pertaining to institutions and to transaction costs.

The policy crisis in many agrarian countries is that increases in food production are barely able to keep pace with--and often fall behind--the rate of population growth. The policy crisis in the industrial world is the well-known overproduction trap driven by scandalous outlays of tax revenues for price supports, export subsidies, and surplus storage. The trite thing to say is that these crises are political in nature--a singularly unhelpful diagnosis. But if we move beyond this simplistic charge to understand the political context in which economic policy is formulated then it would seem possible for the social scientist to make an important contribution to the understanding of these policy crises, and to make meaningful suggestions for reform.³

The Agricultural Policy Crisis in the Industrial Nations

For the past half-century the concern in the industrial nations has been to seek institutional means to insulate the producer from income swings arising from the natural variability of agriculture--all in the name of preserving something known, metaphorically, as the family farm. In the United States, the myth and romanticism associated with rurality--from wistful reminiscences about rural America being the fount of democracy, to the myth that life is less stressful in rural areas--have precipitated the development of institutional arrangements that now encrust agricultural policy, and that stand in the way of the necessary institutional change to escape the

³ See Sandbrook for a thoughtful assessment of political reality and the development problem.

overproduction trap. The situation is not very different in Japan and Western Europe. Agriculture in the industrial world is the latest, and possibly the most expensive, of the "entitlement programs."

While it is the political power of the agricultural interests that partially explains the robustness of these entitlement programs, it is the full constellation of institutional arrangements--pertaining to both agriculture as well as non-agriculture--that make correction difficult. The proportion of farmers in the industrialized countries is far too small to explain the staying power of such expensive institutional arrangements. Rather, their stability is found in the fact that they are part of a far wider constellation of institutional arrangements that reflect broad social preferences regarding economic life in general. The citizenry will only become animated when government program costs--or food prices--escalate beyond some "reasonable norm" (Cochrane). The complex and interrelated institutional arrangements of the modern state--reflecting politically expressed tastes and preferences--seem to prevent an abrupt solution to the overproduction trap. Agricultural policy reflects, in a general way, social preferences regarding rural life. This preference has certainly been explicitly discussed in Western Europe and in Japan; it is somewhat more implicit in the United States.

Note that it is the institutional arrangements in the agricultural sector that help to explain observed patterns of exchange, production, and reproduction. The overwhelming constant in the agricultural policy of industrialized countries is distorted price signals for both outputs and for inputs (Bowers and Cheshire; Schultz). These distortions create a production plan in agriculture that encourages monoculture, the substitution of purchased inputs for produced inputs, and the substitution of capital for family (and other) labor. To exploit the scale economies that flow from this mode of production means that producing units get larger and larger. These production tendencies show up in the domain of reproduction in terms of farm family size that is, lately, not materially different from that of urban households. In the domain of production, the increased specialization has led to the much-lamented "commoditization of agricultural policy" (Cochrane). This evolution of narrow and powerful farm commodity groups has increased the degree of fragmentation among agricultural interests in the industrialized world and, coupled with the acquiescence of the general public, render a reform of agricultural policy somewhat difficult.

Institutions in the domain of exchange influence enterprise choice in the domain of production, and this then gives rise to a convergence of economic interests and the derivative collective behavior that reflects back to influence the domain of exchange (where agricultural policy works directly).

The Agricultural Policy Crisis in the Agrarian Nations

Whereas the industrial nations are caught in an overproduction trap, the agrarian nations are, for the most part, caught in an underproduction trap. In these countries, many of them newly independent in the past 30 years, we have an explicit state presence in agriculture and the accompanying absence of the institutional foundations of exchange. This heavy presence of government is a natural reaction to the excesses of powerful landlords and patrons during pre-colonial (and even during colonial) rule. Upon independence the first mandate of the new rulers was to protect the small

producer from the arbitrary and capricious actions of the economically powerful. We now have a system in which the small producer is at the mercy of the arbitrary and capricious actions of bureaucrats.

One should not be thought overly ideological to observe that agricultural production is, for the most part, inversely related to the extent to which the state plays an explicit role in agriculture. In the agrarian nations we see the state as an explicit economic actor in agriculture--providing inputs directly to farmers, buying output, providing credit, and even providing tractors. Yet, against this backdrop of explicit economic activity on the part of the government, the institutional arrangements that might otherwise encourage increased production are missing (Bromley 1986). In the absence of the state as omnipotent planner and rationalizer, these missing institutional arrangements would provide alternative mechanisms for risk spreading beyond the family and circle (network) of acquaintances, and they would stimulate the sort of exchange activity that would draw individual farmers out of their current autarkic self-sufficiency. These institutional arrangements would permit a greater degree of risk spreading in the domain of exchange, thus permitting greater specialization in the domain of production. With production more specialized, the farmer would have an easier time mastering the required management processes of a more restricted enterprise set and it is reasonable to suppose that production would increase. The danger is, obviously, that--just as in the industrialized nations--these narrow commodity-oriented producers would eventually obtain untoward economic and political power and soon distort agricultural policy. Persistent famine and starvation, however, seem a rather steep price to pay for the avoidance of this eventuality.

It is common in the agrarian nations to find that the domain of exchange is not well developed. The legal foundations of the economy were never fully established following independence but were, rather, thought unnecessary given the active role to be played by state enterprises, and state tinkering. This explicit and often overbearing role for the state has not allowed alternative institutional arrangements to evolve. In consequence there are limited opportunities for farmers to engage in transactions across time and space. Most exchange occurs within the family or a limited network of friends and acquaintances. Occasionally there will be transactions with traders, but these are over a limited domain of goods. The meager opportunity for exchange then influences the domain of production by encouraging the family to produce a variety of commodities. This imperative to diversify arises for two reasons, one related to risk, the other related to the desire for a more complete consumption set on the part of the family.

When a farmer cannot rely on a wide array of institutional mechanisms (including the market) to offer some degree of risk spreading, then enterprise choice will, of necessity, need to provide that function. By undertaking several types of productive activities, preferably those with uncorrelated distributions of stochastic variation, the farmer can hedge against weather variability, disease, or other unforeseen events. If drought kills the millet at least he will have groundnuts, cassava, and his livestock. If he is lucky he can get a good price for some of these products and purchase the necessary millet. The greater degree of enterprise diversification will also mean that there is an increased need for family labor to assist in management of the varied production enterprise. The implications for the domain of reproduction are obvious.

On the consumption side, if the farmer has limited access to exchange opportunities to acquire the variety of products that the family needs (or desires), it will be necessary to produce that variety internally to the decision unit (the family). The enterprise mix will, of necessity, be more heterogeneous to meet this consumption imperative as a result of the absence of greater opportunity in the domain of exchange. Transaction costs explain the prevalence of exchange within the family-network arena, and the absence of exchange in the larger market economy. That is, the essence of exchange within the family and the network is that of low information, contracting, and enforcement costs. Members of the family or of the network have fairly reliable information about the products they might exchange, they are familiar with one another and hence negotiation is both straightforward and non-strategic, and there is great confidence that once a deal is struck it will not be contravened by one of the parties to the exchange.

On the other hand, if a farmer is to enter into exchange with a stranger, then information may be unreliable, contracting can be protracted and uncertain, and enforcement is a potential problem. It is these higher transaction costs for exchange beyond the comfortable domain of the family or the network that tends to stifle transactions there, and hence we observe--not surprisingly--an enhanced reliance upon the more restricted domain of the family and the network of acquaintances. While the family and the network are reasonable domains across which farmers can spread risk, the scope for risk spreading is limited. This forces a more diversified production plan than if there were greater scope for market exchange. Institutional arrangements, which determine the nature and magnitude of transaction costs, provide the explanation to the patterns of reproduction, production, and exchange in the agrarian economy.

Of equal importance, it is the existence of high transaction costs that explains the absence of well-developed market systems in the agrarian state. If transaction costs are high for the farmer, they are also high for those who would seek to establish themselves as market intermediaries--a necessary part of any well-functioning market. An aspiring grain merchant or input supplier will face the same impediments that the farmer faces. Information is costly, negotiations--because they are not routine nor standardized--are protracted, and enforcement--because there is a poorly developed concept of contract law and administrative procedures--is haphazard (Bromley 1986). The absence of the institutional foundations of exchange create high transaction costs for all parties.

The Challenge to the Social Sciences

While there is a policy crisis in agriculture in both the agrarian and the industrialized nations, I suggest that there is an equally serious crisis in the agricultural social sciences, of which I am most comfortable addressing the problem within economics. Indeed the policy crisis may be partly attributable to the virtual absence of politically acceptable policy alternatives emanating from the research of economists. Economists, by training and disposition, are reasonably dedicated to the idea that markets are best when they are the least manipulated by extra-market forces. Since the world-wide depressions of the 1930's, the citizens of the market-oriented countries have made it abundantly clear to their political leaders that while the upside of markets can be exhilarating indeed, they wish to have nothing to do with the downside. Economists have been consistently slow to apprehend

this fact. Indeed, many economists spend a good bit of their time puzzling over the fact that politicians seem more intent on pandering to the wishes of their constituents than paying obeisance to the gospel according to Adam Smith; a behavior that is attributed to the inscrutability of those elected to serve in a democracy.

One can speculate on the state of our science and its policy advice if more economists would spend an equal amount of time helping to develop a system that was both efficient and politically acceptable, rather than advocating a system that the citizenry has resoundingly declared it does not desire.⁴ While the citizenry pays frequent homage to the virtues of markets--and this may be the source of confusion to economists--this celebratory cant is just that. The average citizens knows full well that unrestrained markets can be ruthless; prices might go up, wages might go down, and people might be put out of work. Most economists, insulated in the secure halls of the academy, find it rather easier to suggest the kind of market discipline that we have fought so hard to escape. What is said to be wonderful for the goose is a source of considerable terror for the gander.

This market faith among economists shows up in several ways when attention is turned to the rural sector. When the food problems of the agrarian nations are being discussed the answer is predictable; get government out of the market so that free enterprise can flourish. This is called "getting prices right." In the industrialized nations most economists will offer the same advice. Agricultural economists, more in the thrall of their employment in colleges of agriculture, are usually a little more circumspect. But even there, the search is to get government out of agriculture in way that will not overly jeopardize the "family farm." And so policy analysis consists of tinkering around the margins, suggesting supply control, buy-out schemes, and other forms of bribes and subsidies that will slow down the embarrassing abundance of food and fiber.

The belief in getting government out of agriculture in the agrarian nations, and in reducing its prevalence in the industrialized nations, is strong in spite of little analytical understanding for the institutional environment of agriculture either in the agrarian nations or in the industrialized nations. For the most part the development debate concerning the food production problems of the poorest countries--especially those in sub-Saharan Africa--has focused on either the technical fix, or the facile nostrum of getting government out of the way so that the entrepreneurial skills of the farmer can take over. To cast the problem thus is to miss the sociocultural context of agriculture in the poorest countries, and it is to believe that markets and their associated institutional arrangements--including those that allow markets to operate in the first place--simply spring from thin air. Modern inputs cannot spread their benefits to a wide spectrum of farmers in the absence of an institutional structure that facilitates a wide market for

⁴ There is an efficient allocation of resources for any particular institutional setup and distribution of endowments. Welfare economics does not provide an unambiguous basis for concluding that one particular efficient allocation is to be preferred to another efficient allocation. Hence, one must be cautious in their complaint that if only the politicians would leave things alone we could attain efficiency.

those inputs, that indicates who shall reap the benefit stream from those inputs, that establishes functioning credit markets, and one that generally creates the conditions for a market-related--as opposed to a family-related--agriculture. Likewise, the recent interest in "getting prices right" by limiting the role of government confuses the implicit and the explicit roles of government in agriculture.⁵

Government's role in agriculture in most of the poorer countries is an explicit one--the government is an active economic agent on both the input and on the output side. But to reduce or eliminate this explicit role without at the same time replacing it with an implicit role is to leave the individual farmer at sea. By an implicit role for the state I mean that government must establish the legal foundations for exchange--institutions--such that independent farmers, often separated by great distances, will have the opportunity to enter into market (or market-like) transactions on the input side as well as on the output side. This is not to say that the small farmer in Africa should necessarily be subjected to the very market forces that have been so convincingly rejected in the industrialized countries. But it is my maintained hypothesis that food production in the agrarian nations is low precisely because farmers are locked into a system of excessive dependence on family and a small coterie of acquaintances for the bulk of economic exchange. This means that the domain over which risks might be spread is extremely restricted.⁶

In the industrialized countries there is growing concern among both economists and the general public that the expensive and counter-productive agricultural policies must be exorcised from the policy arena. The discussion is usually cast as one of keeping the current system, or of resorting to "free-market" conditions. The national treasuries cannot long afford the status quo, and there is scant political support for the free-market alternative. The realistic alternative is to suggest modifications around the edges of the existing structure and this economists have done. But there seems to be far less serious interest among economists in studying the industrialized nations' agricultural sector in the broader socioeconomic milieu. The focus seems to remain--for the most part--on tinkering with different support programs to ameliorate the strong production incentives that they create.

I suggest that a closer look at the institutional arrangements and the transaction costs of the status quo--and some sweeping alternatives--would reveal policy options that have not, as yet, been recognized. Why is there so little agricultural policy analysis that attempts to analyze the political economy of agriculture? The answer, I believe, is that most policy research, like most political action, is focused on particular commodities. The policy analysts will likely protest that the various commodity programs are now so complex that it is all they can do to study them individually. And that may

⁵ See Timmer for a discussion of how to get prices right.

⁶ These ideas have been worked out more thoroughly in Bromley and Chavas. I am indebted to my colleague Jean-Paul Chavas for assistance in clarifying these issues.

be so given the current focus of policy research, which is largely confined to computer simulations of "what if?" scenarios. Social scientists in the agricultural colleges--with a few exceptions of sociologists concerned with the social implications of biotechnology--are singularly incurious concerning the institutional context of agricultural policy.

The concern has been expressed recently that the 1985 Farm Bill, regarded as a policy disaster by most economists, was adopted in spite of an unprecedented amount of agricultural policy modeling and advice. Yet the critic might comment that computer runs cannot provide a substitute for a careful understanding of the political context of emerging policy. In the agrarian economies, I see little evidence that economists understand the institutional basis of a functioning and vibrant economy. The plant breeders search for miracle seeds while the economists preach the faith of free markets.

The challenge to the agricultural social sciences is to move beyond faith and simulation models. It will be necessary to see the economy as a set of ordered relations (institutional arrangements) that define choice domains for individuals. Classical economists were interested in aggregates of income, how it was distributed, and the general welfare of the society. The ascendancy of neoclassical economics was accompanied by the felt need to purge economics of an ability to comment on social well being. It was Lionel Robbins who, playing on the scientific aspirations and insecurities of economists, advocated the position that a scientific approach required the elimination of interpersonal comparisons of utility. In his confusion he failed to understand that to make interpersonal comparisons of utility is not to make value judgments, but rather to offer untestable propositions. Such propositions are simply true or false. A proposition that is untestable does not automatically become a value judgment (Blaug).

If economists have become irrelevant to agricultural policy, and some may argue the point, it is in all probability due to the all-consuming fear of appearing unscientific. Such concerns being sufficient to drive economists into a retreat from the political economy of agriculture. This retreat is reinforced by the belief, fostered by the new welfare economics, that it is possible to have policies without politics, or that controversial policy recommendations can be made without value judgments (Bromley 1988). We have allowed the illusion to persist that political decisions and difficult choices can somehow be conjured away by welfare economics.

Hutchison expressed concern several decades ago that a belief in the objective and scientific basis of policy pronouncements, and a retreat into the false security of welfare economics, would lead to public confusion and disillusion regarding the application of economics to questions of public policy. That many believe this to describe the current situation may be the ultimate challenge to the agricultural social sciences.

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On Agricultural Decision Making: Private or Public?

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I should begin the discussion of decision-making by introducing some philosophical concerns. I don't mean that these concerns belong exclusively to departments of philosophy; indeed, these departments have in recent years shown a strong indifference to the issues I'll discuss. They have been fascinated by the question whether one can infer a generality (e.g., a "theory") from specific facts, which they call the problem of "induction," but have infrequently discussed whether one can infer the appropriate decision from whatever knowledge exists. Put otherwise, if we wish to improve decision making in agriculture, do we do so by improving the data and theory of agriculture, or do we do so by other means besides research?

All this adds up to two theses of agricultural research. One says that the better the research, the better the policies of agricultural activities. The second says the better the research, there is no guarantee that the agricultural policies will be better, and may be worse.

I am going to argue for the second thesis in this paper. This argument, if true, implies that the stated goals of SSAAP may need some re-examination.

For purposes of communication, I should explain who I am and why I've arrived at this conclusion I've just made. My background is in philosophy, but I was educated (at the University of Pennsylvania) by E.A. Singer, Jr., and H.B. Smith. Both believed that philosophy made no sense unless it helped us understand an area of deep human concern, and "understand" meant that we could do something of ethical importance by means of our understanding.

Hence, for them, "epistemology" or the theory of knowledge, did not mean

merely "how do humans acquire knowledge which can be translated into actions that improve the human condition?" going from specific facts to generalities is a far simpler problem than going from factual knowledge to conclusions about what should be done. Indeed, many positivists (believers in "facts" as the ultimate knowledge) thought that this second problem was insoluble. But I was convinced that the positivists stated the question of "what is good research?" in the wrong manner. They thought that "good" research establishes "sound facts." Whereas I (and my mentors) thought that "sound facts" (or "theories") only had this quality if they led to "sound" (ethically justified) decisions.

"Decision" comes from the Latin word "to cut," and hence has a deep ethical implication, because if we "decide", we at the same time cut off all other opportunities from the tree of our lives. And we should ask ourselves whether the branches we cut off are ethically significant.

Hence, as a young man interested in research, I early asked myself what kind of research? The answer was: research which helps to produce ethically valid decisions, and the ethically valid decision is one which "cuts off" less valid decisions from the tree of life.

I hope it has become apparent that I could find no home among the discipline. To be sure, "ethics" seems to belong to "philosophy", but I could find no journal or article calling itself philosophy which dealt with "opportunity costs", i.e., the loss of cutting off a good branch. Nor did economics journals and books deal adequately with this problem. Nor psychology, political science, engineering, whatever. The reason becomes apparent once one recognizes that the problem of cutting off a good branch leads one necessarily

into a lot of disciplines, not just one. Nor is it at all clear to me that the strategy of dividing research into disciplinary sectors serves the aims of sound decision making very well at all. I've found, for example, that a study of economic values inevitably runs into psychological issues; but because these issues are obscure to the economist, he tends to shove them beyond the barriers of his discipline.

I was asked to write a paper on private vs. public decision making, and this will be the main thrust of this paper. But it seemed to me that I had to write these introductory remarks to put the question in its proper setting. The question is an ethical one. In its general form it asks "who should decide?" This is a central question of all systems planning, but we have yet to understand how it should be addressed in an ethically just manner.

As an example, consider the question of whether a farmer should sell his farm and move to the city. Who should decide? It seems evident that the decision should be private. It should be the farmer's business, not government's. But, as in all decision making, there is no way to reduce a question like this one to a simple, self-evident answer. When I was in Sweden recently, I visited a milk farm. The farmer explained that he had to pay interest on the loan that helped him buy the farm. But the government in Stockholm decides the interest rate. Recently, the government raised the interest rate, so that some of his neighbors realized they couldn't keep their farms alive. Hence, they were moving to the city. Now who was the decision maker? The bureaucratic process which raised the interest rate, or the farmer? Furthermore, why was the interest rate increased? Because certain events of a financial nature happened in Stockholm. These "events" were the result of other

decisions. In fact, rarely are there such things as isolated decisions. "Decision" implies a network of decisions connected in complicated ways.

And also disconnected. From the point of view of the farmer, no one in Stockholm ever consulted him about raising the interest rate, even though his concerns about his family and ownership seem to him to be central. Many systems planners have inferred that there is an axiom lurking in the background here, namely, that all those whose interests are involved in a decision should be a part of the decision's network, i.e., should be a part of the "conversation" about the decision.

Thus it seems to turn out that "public" vs. "private" is not quite the right question, ethically. The right question is how we humans design the conversations about decisions, using the axiom proposed above. But the idea behind the original question still remains. How do we design the conversation to avoid the disconnections of the Swedish example? Or, was great injustice done to the American people, when Congress and the Executive Branch, without any consultation with the people, revised the tax laws of the USA? Perhaps the "consultation" had already taken place by voting or not voting for candidates for election.

I feel as though I had been transported via time to a hot July in Philadelphia in 1787. To ask me whether decision making should be private or public, is to ask Madison the same question. The answer of those gathered in Philadelphia was to design a public design of decision making. Imperfectly, to be sure; but from the point of view of "science" (or "research"), the very best they could do (a "miracle" for Madison).

I believe that some of those gathered together to design a USA, must have wondered about the future of such a nation. If they did, did they wonder what that future would be like? Did they wonder whether people in 1877 would have the same concerns which they had? Could they believe that a century later a most terrifying and destructive national civil war would have occurred, and that the wounds would still be there even in 1977? Did they realize that, in effect, by designing the precious Constitution of the United States of America, that "We the People" had planted the seeds of murder of brother against brother? No way. And yet that is exactly the challenge of systems thinking. I'm impressed by the efforts of people who claim to be practioners of "conflict resolution." I'm unimpressed by the short-sightedness that often occurs.

To me, the major aspect of this shortsightedness is future generation. Suppose those who designed the Constitution in 1787 had made justice for future generations as the main topic of their conversations (indeed, some of them did). I doubt if "property" or even slavery would have been the main topic of their conversation, anymore than agriculture vs. technology should be our main topic today. Because we have to ask, what difference does it make in the lives of those as yet unborn, whether old fashioned agriculture wins out against the immense power of agricultural technology?

This question leads me back to the introduction to this paper. To ask how significant agricultural technology is for future generations is to ask whether research should be a significant component of the decision process in agriculture, not only for the affluent countries, but also for the impoverished.

For some, research should lead the way. It should be able to tell us which

decisions are ethically appropriate and which are not. The so-called "Green Revolution" is a case in point. It was primarily born out of research; it showed how agricultural productivity could be increased vastly by "proper" use of seeds and fertilizers. The prescription (for action) seemed clear: "Farmer's of the world, use the techniques of the Green Revolution" and you will be free! Not so. Everything seemed to point to the fact that if "research" is made the prime component of the agricultural decision network, then the world's hunger problem would be "solved." But it didn't happen that way. "Productivity" was not the problem, but "distribution" might be.

Hence, I'll return to what I proposed earlier. Suppose agricultural research is vastly improved. Will that condition imply a far better decision making process than has ever existed before? My answer was that in the history of research there is very little evidence that research itself has led to an overall improvement of the human condition. This may seem to be a harsh judgment, considering that the middle class of the world can eat better, travel faster, keep warmer, get a far better education and health than ever before, mostly because of what we have learned through research. But then we have received other "gifts": nuclear warfare, ways of exploiting others, killing 50,000 automobile drivers a year, starving a billion people, including children 0-6 years old, and polluting widely, all or partially because of research efforts.

At one time of my research life I asked myself this question: suppose a group of people were given perfect information to solve a problem. Would this gift lead them to the solution? So I and a colleague (Philburn Ratoosh) set up an experiment of a group of five graduate students. We asked them to run a small

business firm which manufactured and sold three writing instruments. We provided them with enough detailed information to determine how they should set prices, production schedules and purchase of raw materials. In fact, we asked them to maximize a mathematical function, subject to certain constraints, but we didn't tell them this. They were to believe they had to run a small enterprise in order to maximize profits. In their midst we planted a "stooge" who would tell them how perfect the information was. The result? In more than forty tries, with a wide range of strategies employed by the stooge, every attempt to use the perfect information failed.

This was not an unrealistic experiment. Today's research also stands apart from the decision making of organizations, and feeds it information through its journals and books. The extent to which the decision making network responds may be very much like the way our subjects responded to the stooge. In fact, in the real world the situation may be much worse, because the research world is not responding to a specific decision problem, but to other issues which may not be relevant.

This point of view is reflected in the first report of SSAAP by a farmer from Illinois:

"Social problems, their recognition and definition as applied to rural people -- for what purpose? Social science disciplines as purely academic studies have little appeal to me."

This judgment is correct in some ways, but there is no reason why it should be regarded as final. But from my limited knowledge of agricultural business, I am led to suspect that agricultural decision making should also have little

appeal to that farmer. Hence I perceive that applied agricultural research has a very important research program to address: how should agricultural policies be decided? The question has a hidden paradox, because I can't help feeling that the consequences of any significant agricultural policy are chiefly of interest to future generations, who can have no voice in deciding about a policy. Vast areas of the food-producing parts of the earth are planned on the basis of a very short planning horizon, or not planned at all for political reasons. Vast sections are being eroded and polluted without any attempt to study the possibilities of reversal. The reports I receive are mostly negative as far as the lives of future generations are concerned (Sweden's tree cutting activities are just one example; the future of California's big valley is another; so is southern Sudan). The big question is how we humans can be starving so many people when there are huge excesses of agricultural production.

Future generations will have to face a much worse world of food than this one, unless something is done about it. Some would like to say that we can't predict what future generations will want. This seems to me to be a rather silly remark, because I take it to be axiomatic that they will be much like ourselves in wanting (a) not to starve or suffer from severely debilitating diseases, (b) not polluted to death, (c) not blown up, to live lives of high quality in education and the arts.

We the living can certainly argue among ourselves what these future values really mean, and we should. I believe we should also do our best to design a decision-making process for the agricultural world, and I hope that SSAAP will take a leadership role in this regard. I'd add one important warning. There is a strong tendency alive today that "experts" are only to be found in public

institutions. I was once chairman of a National Academy of Science committee on rural poverty in America. We had a staff member who went out in the field and interviewed county supervisors, mayors, professors, etc., about rural poverty. He never interviewed a poor person or family. I concluded that we, as a committee lacked essential information on rural poverty because we had no clear idea at all as to what it was like to try to live a life of an impoverished person in a rural area. One of the committee members wanted us to recommend the establishment of a National Institute of Rural Poverty - in Washington, D.C. Apparently he had caught the D.C. disease; where one becomes convinced that D.C. has a power of knowledge that no local area could have.

Hence, my conclusion, if it is one, is that "public or private" is the name for a research project in agriculture, namely, how should the agricultural decision making process be designed?

ANTHROPOLOGY, EVOLUTION, AND AGRICULTURE

Billie R. DeWalt¹

Introduction

The standard answer to what anthropology can contribute to agricultural development usually focusses on its importance for documenting how culture and tradition are obstacles to change. Textbook cases cited as support for such anthropological involvement include examples like the failure of dwarf wheat in villages in which long-stemmed straw was an important construction material, or cases in which high-yielding varieties of rice were rejected because people did not like their taste. While such specifics of culture are important to recognize and appreciate, most agricultural anthropologists today are not content with a role in which they are only useful for the description of cultural minutiae.

Over a decade ago Frank Cancian wrote a much more sophisticated appraisal of whether anthropology could help agricultural development. Cancian pointed out that anthropology has a "practical holism" (1977:6) that is important for: 1) understanding the broader context within which agricultural development occurs, 2) seeing the dangers of considering some outcomes as unintended "side-effects" of development, 3) helping to set goals for development instead of just evaluation of programs, and 4) establishing that social "laws" are as important and as accurate as most technological laws. He went on to discuss several generalizations about agricultural development that seem to apply across a wide variety of cultural settings.

My purpose in this paper will be to build on Cancian's argument and to suggest that anthropology and anthropological approaches can be among the most powerful tools that we have for predicting and understanding the long-term (macro) effects of agricultural development as well as for demonstrating the real-life (micro) consequences of these processes for individuals and communities. If this is the case, then one can legitimately ask why anthropology is not more well represented in the literature on agricultural development? The first part of the paper will look at the topical and

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institutional constraints that have limited the discipline's contributions to debates about agricultural issues. The second part of the paper will discuss the anthropological contributions that have enlightened our understanding of agricultural issues. The final part of the paper will outline a theoretical perspective in which anthropology has a "comparative advantage" that I believe is important for getting a greater grasp on development issues. This perspective is also useful for expanding the boundaries of the issues that are important to consider in generating policy solutions for the problems of agriculture and development in the contemporary world.

Constraints to the Anthropological Contribution

Topical Constraints

An important constraint on what anthropology has contributed to our understanding of the processes of development relates to the subject matter of the discipline. A popular and accurate definition of anthropology is that it is the study of all aspects of all humans at all times and in all places. What this means is that anthropology covers an immense variety of topics, with the practitioners of the discipline using a vast array of different theoretical and methodological approaches. Of the four main subfields of anthropology, linguistics is especially concerned with the study of the primary means of human symbolic communication (language) through time, physical anthropology focusses on the paleontological origins of humans and the genetic bases of behavior, archaeology studies human remains to understand sequences of social and cultural evolution under diverse natural and cultural conditions, and sociocultural anthropology describes and analyzes the forms and styles of social life of past and present ages (see Harris 1975:1). Within these broad subfields are an incredibly diverse set of sub-subdisciplines. When one adds theoretical and methodological differences to this variability of subfields, there is easily more diversity than in any other social science discipline. Because of this diversity, academic Departments of Anthropology will rarely contain two individuals whose research and teaching interests overlap to any significant degree. One practical consequence of this diversity of anthropologies is that the discipline is riven with factions and conflicts owing to specializations including (but not limited to) different culture areas, subject matters, time periods, theoretical perspectives, and methodological approaches.

A second aspect of this problem is that because anthropologists deal with "culture" as the primary concept, there is a commitment to a holism that attempts to understand the interrelationships among material, social, and "meaning" or value factors. This has resulted in a relative lack of attention to issues of measurement and quantification (see Pelto and Pelto 1978), a tendency to functionalist theorizing (see Buttel 1987:101), and a general lack of commitment to problems of contemporary and practical significance.

For those individuals and organizations using anthropologists to address agricultural policy questions or as consultants on development projects, securing the services of an appropriate anthropologist is an exercise that involves a substantial amount of risk-taking (see for example the criticism of

anthropologists voiced by Simmonds 1985). There are far too many occasions in which the anthropologist hired to (for example) do a diagnostic farming systems study will become interested instead in the kinship, spiritual or sexual practices of a group. An economist or agronomist hired may be as likely to do a poor job as the anthropologist, but at least their reports and contributions are more likely to use familiar (standard) methodological procedures and relate more closely to the subject matter of interest. The chances of hiring the "right kind" of anthropologist can be improved by acquiring more knowledge about the individual, but there are very few programs that are adequately training people with the requisite skills to address agricultural issues (more on this below).

The flip side of the topical relevance issue is that most anthropologists are likely to share some perspectives that are extremely important to any development situation. First, even though individual anthropologists are as likely as any other social scientist to specialize in some topic or area, the training of an anthropologist usually includes at least a smattering from each of the subfields. The perspective of an anthropologist then is likely to be longer-term, more comparative, and more holistic than that of the other social science disciplines. This can allow the anthropologist to see the broader context within which agricultural development is occurring and to anticipate potential negative aspects of programs or projects. Second, cultural relativism, the perspective that each cultural pattern is as intrinsically worthy of respect as all the rest, makes anthropologists more attuned to the "native" point of view. The appreciation of the anthropologist for so-called "primitive" or folk communities has meant that practitioners of the discipline have worked in some of the most isolated and logistically difficult parts of the world. While Chambers' Rural Development: Putting the Last First (1983) persuasively argued the importance for development as a whole to better focus on the poorest, most isolated, and resource-scarce communities, anthropologists have had this perspective for a very long time. That anthropologists have worked so frequently in isolated, resource-poor communities is probably their single most positive feature from the perspective of other disciplines and practitioners involved in agricultural development.

Institutional Constraints

I believe that anthropology has not been a large part of the debates concerning agricultural development because so few anthropologists are located in Colleges of Agriculture. Agricultural economists and rural sociologists have essentially cornered the market on social science involvement in domestic agricultural issues because they are located within the institutions that serve as the grassroots from which participants in such debates are drawn. During the period in which social scientists were incorporated within Colleges of Agriculture, anthropologists were correctly perceived as being concerned principally with non-Western cultural groups. For this reason, their skills were not deemed relevant for social issues of importance to agriculture. The dozens of anthropologists in departments of anthropology at land-grant universities have little contact with their colleagues in Colleges of Agriculture. Although a few anthropologists do now hold appointments within departments attached to Colleges of Agriculture, few of these individuals

concomitantly participate in the main departments of anthropology located in Arts and Sciences.

Because anthropologists are not incorporated into Colleges of Agriculture, they are much less conversant with the issues concerning agriculture. The reward structure for the discipline is oriented significantly toward Arts and Sciences -- they generally have heavier teaching loads, are discouraged from doing research that is applied, are evaluated on the number of publications in more traditional outlets, and have little or no contact with agricultural scientists. There are substantial differences in the language, dress, styles of oral presentation of research, and patterns of interaction of anthropologists who have never been involved in research relating to agriculture.

Making it even more difficult for anthropology, the discipline of anthropology is characterized by what Cancian (1977) called "antiestablishment exceptionalism" -- or as Levi-Strauss (1973) has noted, to be relatively critical of their own culture while romanticizing the lifeways of other cultures. In the relatively staid conservative atmosphere of the agricultural establishment, such attitudes are not valued.

The one significant involvement of anthropologists in studies of U.S. agriculture in the 1940s illustrates this problem. Goldschmidt's pioneering study of the effect that corporate control of agriculture had on small rural communities in California was suppressed by the Department of Agriculture. Goldschmidt's conclusions that the quality of life was better in communities that still had small farms was not palatable to agribusiness concerns and their supporters in U.S.D.A. and Congress. It took superhuman action by a sympathetic U.S. senator to get the report published. By then, Goldschmidt had been fired from his position within the Bureau of Agricultural Economics and he has written that it "... surely contributed to" the demise of that agency (1978:455). With the exception of Bennett's work on Canadian farmers (1969; 1982), there was little further anthropological research on North American agriculture until the 1970s (see Chibnik 1987).

That there have been few opportunities for anthropologists in Colleges of Agriculture and in agricultural institutions has affected the composition of our discipline. There are only a few dozen members of the Anthropological Study Group on Agrarian Systems which sporadically publish a newsletter (Culture and Agriculture). Only the departments at the University of Kentucky, University of Florida, University of Arizona offer anything resembling a program in agricultural anthropology. Even in those institutions the relationship of anthropology to agricultural science and even agricultural social science disciplines is far from ideal.

An interesting contrast to this picture is with medical anthropology. Significant involvement of the social sciences in Colleges of Medicine began much later (in the 1950s) than in Colleges of Agriculture, and the basic social science departments in Medical Schools are multidisciplinary units identified as behavioral sciences or community medicine. Anthropologists are well-represented in these departments, as are psychologists; philosophers and historians are sometimes also included. Medical anthropology is a burgeoning

subfield in anthropology. At least three major journals are devoted to publications of medical anthropologists, its subunit within the American Anthropological Association has about 1200 members, and many Departments of Anthropology offer specializations in it at the M.A. and Ph.D. level.

The Anthropological Contribution

This is not to say that anthropology has not contributed to our understanding of agricultural processes and agricultural change. Because several reviews of this contribution exist (see Netting 1974; Orlove 1980; Chibnik 1987), I will concern myself here only with highlighting some of the most important earlier contributions.

The Anthropology of Small-Scale Communities

Anthropology's concern with the documentation of the cultures of non-Western small-scale societies has frequently extended to showing how the material base of the group relates to other aspects of its culture. Implicitly or explicitly most anthropologists generally accept an organization of "types" of society that is based on evolutionary principles. One common formulation includes the stages: Band, Tribe, Chiefdom, Primitive State, and State (e.g. Service 1962). This categorization is based primarily on social principles including the type of economic system, leadership patterns, demographics, and so on. A second formulation is based much more on the material base of societies and includes the categorization: Hunters and Gatherers, Pastoralists, Horticulturalists, Peasants, and Industrial Societies. In general, there is a strong relationship between the categories with hunters and gatherers almost always organized as bands, horticulturalists and pastoralists as tribes and sometimes chiefdoms, peasants are part of primitive states, and so on.

A significant amount of debate in anthropology has been spent on which of these categorizations is the most accurate, how various societies (e.g. people who depend on fishing) do not fit neatly into the "types", whether we should view these kinds of societies as comprising an evolutionary progression, and so on. We do not need to be concerned with these debates; what is of importance is that the earliest and best evidence on many of the peoples who presently make up the large majority of rural people in the Third World was collected by anthropologists as part of their study of horticulturalists and peasants.

Classic studies of what is now known in agricultural circles as slash and burn, shifting or swidden cultivation were carried out by Conklin in the Philippines (1957), Geertz in Indonesia (1963), Rappaport in New Guinea (1968), DeSchlippe (1956) in Africa, and Johnson in South America (1975). These studies have become widely cited in the agricultural science literature because they inform us about both the actual agricultural practices as well as about the social systems within which these systems exist. Understanding these kinds of systems is important because there are about 250 million people around the world who practice shifting cultivation (Sanchez 1976:346; Moran 1979:267).

The largest number of people in the world are peasants. Many of them practice shifting cultivation, but there are also many who intensively farm the same plot of land year after year. The anthropological study of their societies and their agricultural practices began in the 1930s with Robert Redfield (1930). Since then, hundreds of studies of peasants in many parts of the world have been carried out by anthropologists. With few exceptions, these are all microlevel studies of villages or communities. The general purpose of most studies was and is to contribute to the understanding of the lifeways, unique world views, and other cultural attributes of peasants. Documentation of the agricultural system has usually been present only as a background within which other aspects of the culture can be explained. Though these studies inform us about some of the interrelationships among agriculture and other aspects of society and culture, their relevance for guiding and directing agricultural development is usually not explicit (see DeWalt 1986 regarding anthropology's lack of contribution to understanding agrarian systems in Central America).

The most relevant pieces of anthropological research have been undertaken by individuals who characterize themselves as ecological or economic anthropologists. Among the most useful of peasant studies for understanding agricultural systems are Geertz (1963) on Indonesia, Lewis (1951) and Cancian (1972) on Mexico, Hill on Nigeria (1972; 1982), Johnson on Brazil (1971) and Epstein (1962; 1973) on India. To my knowledge, none of these studies was undertaken in conjunction with an agricultural development project, yet all contain important thoughts and ideas concerning how the results can help in implementing development. Until the late 1970s, the only anthropological effort of direct intervention to attempt agricultural development was the Cornell University Vicos Project in Peru. This project was and is still extremely controversial (see Mangin 1979). In terms of institutional factors, its major lingering effect was to eliminate any consideration of applied anthropology from the Department of Anthropology at Cornell.

Within the last decade, however, more and more anthropologists have begun working directly in development agencies and in institutions directly concerned with agricultural change. In part, this resulted from the wave of legislation and initiatives in the 1970s that put more emphasis on new directions emphasizing equality, farming systems research, incorporating women into development, and a greater focus on the poorest of the poor (see DeWalt n.d.). All of these emphasized the need for greater understanding of social and cultural factors in development. Because anthropologists were the social scientists who had the language skills and the most experience in Third World settings, there was a greater demand for them in development work. At the same time, the declining academic job market resulted in many anthropologists looking for positions outside of universities.

One result was that the number of anthropologists working in USAID quickly jumped from only 1 in the early 1970s to 22 by 1977 (Hoben 1980:364). [With the advent of Reaganism, this number declined substantially in more recent years.] The currents that were affecting USAID were also being felt in other agricultural development settings. One of the most significant efforts was the Rockefeller Foundation's "Social Science Research Fellowship in Agricultural and Rural Development" that was created in 1974. By 1984

thirty-three social scientists (21 of whom were anthropologists) had been placed in the International Agricultural Research Centers (Rhoades 1985:5). Two institutions (CIMMYT -- the International Maize and Wheat Improvement Center and CIP -- the International Potato Center) presently employ anthropologists as senior scientists and anthropologists are working in several other centers as well. Several recent books documenting the role that social sciences can play in the agricultural research and development process have prominently featured the work of anthropologists. These include The Role of Anthropologists and other Social Scientists in Interdisciplinary Teams Developing Improved Food Production Technology (IRRI 1982), Coming Full Circle: Farmers' Participating in the Development of Technology (Matlon et al 1984), Breaking New Ground: Agricultural Anthropology (Rhoades 1985), and Putting People First: Sociological Variables in Rural Development (Cernea 1985).

The role of anthropologists in these programs is essentially the same as the one that was envisioned for agricultural economics and rural sociology when they were incorporated into the land-grant institutions. As Buttel has written:

The roots of the social science presence in land-grant and SAES institutions lie in problems experienced by the land-grant system in encouraging farmers to use new technology and to improve their management practices. For all practical purposes agricultural economics emerged as farm management economics and was oriented to assisting farmers in allocating their resources more effectively and profitably. Rural sociology was largely created in the aftermath of the Country Life Commission, which recommended that the SAESs engage in social science research to assist in the transfer of technology while at the same time preserving the social and moral fabric of rural communities (1987:86).

This role for the social sciences is one that I have recently dubbed as social science in agriculture -- that is to facilitate the work of other agricultural scientists. Social scientists are expected to help transfer technology, to think about ways to mitigate potential problems, and to evaluate the results of such transfers. The assumption is that the agricultural technology being generated can help to solve the problems of small farmers in developing countries.

The role of the anthropologist in these settings is thus to serve to further the goals of the agricultural-biological scientists by acting as, in effect, a cultural broker between farmers and researchers. This is made most explicit in the work of Rhoades and Booth (1982) at the International Potato Center who have nicely illustrated the means by which "acceptable agricultural technology" can be generated. In their farmer-back-to-farmer model, social scientists should come to an understanding of the farmer's perspective and needs, then communicate these to scientists who use the findings to design better, more appropriate technology. Under ideal circumstances, the technology is tested and adapted on farm. Anthropologists and other social scientists observe the reactions of farmers and communicate these evaluations back to the research scientists at which point the cycle can begin again.

Further examples of work in this tradition by anthropologists includes that of Tripp (e.g. 1984, 1985), Cernea (1985), Frankenberger (1985), my own work (DeWalt 1983, 1985; Paul and DeWalt 1985) and many others. There is little question that, in the implementation of this model, anthropology provides an important service to both the farmer and the scientist by brokering the communication between them. Particularly in organizations like the International Potato Center where social scientists have very effectively been incorporated into multidisciplinary teams to address technological problems, it works very well. Although anthropologists have often been characterized as the "lone rangers" of the social sciences (see Rhoades 1985), they need to work to improve their ability to work in these teamwork kinds of settings.

The service-oriented research, however, is only a part of what anthropology has to offer to our understanding and implementation of agricultural development. In my view, equally important and perhaps more important is a social science of agriculture. What I mean by this is: the study of the interaction of the natural environment, sociocultural patterns, market conditions, government policy, and technological systems in order to identify agricultural research and/or extension priorities, to determine appropriate institutional structures and responsibilities for research and extension, to predict economic, social, and cultural consequences of agricultural change, and to identify government, agency and institutional policies that will facilitate development of more just and equitable social systems. Rather than performing a service-oriented role within a system in which policies have already been established, a social science of agriculture should provide an on-going critique (emphasizing both positive and negative aspects) of research and development programs, and be a key element in the formulation of policies that will guide and direct research and development efforts (see DeWalt n.d. for further development of this position).

Evolutionary Theory, Anthropology, and Agriculture

From my perspective the practical application of anthropology to the solution of contemporary problems requires theoretical grounding. Within anthropology, as with sociology, there is a wide diversity in terms of theoretical perspectives. Yet there does seem to be one theoretical perspective that has proved to be of great utility in a variety of contexts, though many anthropologists and sociologists have abandoned it without adequately exploring what it can tell us about contemporary human processes. This is the theory of evolution.

The theory of evolution has historically been of substantial importance for anthropologists, especially for physical anthropologists who use the biological aspects of it. After Darwin formulated the idea to apply to biological forms, using the term evolution to apply to social and cultural forms was popular in the late nineteenth century attracting adherents like Morgan and Tylor in anthropology, Comte, Durkheim and Spencer in sociology, and Marx and Engels in political economy. Evolutionary ideas fell into disfavor in all of these disciplines in the early twentieth century, probably for three major reasons. First is that some social scientists propounded an extreme form of social Darwinism in which they argued that it was the natural order of things that the "fittest" (i.e. those groups, races, nations then in

control) should survive; the disadvantaged were in their conditions because they were less fit. Second, many individuals adopted the terminology of evolutionism and adapted it to apply in an analogous sense to culture. Third, many cultural evolutionist arguments took the form of a disguised functionalism -- starting from the material base of the society, the search was on for the ways in which the rest of social and cultural forms fit together to allow the society to "adapt" to its environmental setting.

Nevertheless, there is an implicit acceptance of evolutionism as a paradigm in much social and cultural research. Most anthropologists still organize much of their teaching around the type concepts of band, tribe, chiefdom, state or those of hunters and gatherers, horticulturalists, pastoralists, peasants and industrial society. Archaeologists have continued to find the terminology and ideas of evolutionism applicable to their research showing how prehistoric and historic cultures changed through time. Thus, the terminology of evolutionism to apply to change in sociocultural forms continues to be an important theoretical perspective in anthropology. What has not occurred is much clear thinking about how evolutionary theory can be utilized in the discussion of cultural forms.

According to Davydd Greenwood, who has produced a critique of the way in which nonevolutionary ideas continue to be used in the study of human behavior, there are six basic propositions of Evolutionary Theory:

1. Variation is a ubiquitous feature of all living things. It is continuously and normally produced spontaneously.
2. Selection is the result of the interaction of specific sets of environmental conditions with the variations in species of plants and animals. Selection is the force that gives rise to and alters the categories of living things.
3. The interaction between variation and selection results in adaptation or extinction. Adaptation is always relative to particular organisms and specific environments. Adaptation is never permanent.
4. All forms of life are ultimately related to each other by genealogical connections.
5. There are no nonmaterial forces at work in the evolutionary process, nor are there any "pull" factors in evolution. [My note: This means that evolution is not controlled (at least directly) by some Superior Being, and is not leading toward any goal, perfection, or other "end" state.]
6. There is no radical dichotomy between humans and other animals (between "culture" and "nature"), just as there are no radical dichotomies between any things in nature at all. Species are ranges of variation that intergrade into each other at the margins.

Although the above may seem to apply mostly to biological phenomena, Greenwood and Stini (1977) have argued that biological and cultural evolution are part of the same process. I think that anthropology can significantly improve its theoretical and practical relevance to agriculture if it explores the implications of these principles and improves the application of this theory to cultural phenomena. Evolutionary theory provides a macro framework within

which to view human processes. It does not provide explanations for cultural phenomena (indeed, many people would agree that even in the biological area it is primarily useful for post hoc explanation rather than prediction) so it does not absolve us from finding other theories that can account for more micro aspects of human behavior. There are, however, some important directions that evolutionary theory provides for anthropological (and other social science) research.

Adaptive Strategies and Decision Making

The first three of Greenwood's principles listed above concern the importance of variation, selection and adaptation in evolutionary theory. Microlevel anthropological research has probably dealt with these issues as well as any other social science. Bennett (1976) has developed a conceptual apparatus that allows anthropologists to use these ideas with relevance to agricultural development.

Variation in cultural behavior has been documented by Bennett (1969) and by myself (DeWalt 1979) using the concept of adaptive strategies. Adaptive strategies are "... the patterns formed by the many separate adjustments that people devise in order to obtain and use resources and to solve the immediate problems confronting them" (Bennett 1969:14). In coping or making these adjustments, people are under all sorts of environmental and social constraints. Understanding the parameters within which these adjustments are made can be useful in agricultural development. Several anthropologists have studied the decision making process with regard to agriculture to discern how people formulate adaptive strategies. To give just one example, in my Mexican research I studied how small farmers adopted some specific pieces of new technology from the "technological packages" being promoted by agricultural change agents. The choices made depended on the ecological and economic circumstances of the household, the family's assessment of how they could best improve their material circumstances, and the knowledge base of the household (DeWalt 1979). The collections edited by Barlett (1980) and by Chibnik (1987) contain several other similar examples (see also Barlett 1982; Eder 1982).

Another approach to decision making has been pursued by C. Gladwin (e.g. 1979; 1980) and by H. Gladwin and Murtaugh (1980). Their approach has been to adapt psychological techniques in order to study the actual cognitive processes that people use to make decisions. Decision trees and mapping of the decision rules people use result from these kinds of techniques.

Both of these decision making approaches begin from the premise that people are rational decision makers. By understanding the constraints on their decisions and by knowing their goals, it is possible to appreciate the reasons for variability within and among communities with regard to agriculture and other types of behavior -- that is, to know why people have the adaptive strategies they do. The approach does not assume that these adaptations are the only ones possible or that they are ones that will be positive or succeed. Indeed by knowing something of the natural and social environment in which people live, it is incumbent on the anthropologist to attempt to make some predictions about the probability of behaviors actually being adaptive. Adaptation in the short term may of course be maladaptive in the long term, so

specification about the time dimension of possible adaptive consequences is necessary. Selection, of course, is the process that will determine survival or extinction.

Survival and extinction in this realm rarely refer to actual life and death outcomes, though we can easily imagine situations in which such ultimate consequences may arise. The growing use of pesticides in the Third World in which farmers use them without taking adequate precautions is such a case. Usually, however, survival and extinction will refer to the continuance or discontinuance of the behavior in question (e.g. continue growing maize or switch to another crop) and whether this behavior will continue to be part of an individual's adaptation. In the contemporary world, the pace of change and the range of potential solutions have meant that adaptive strategies are constantly in flux and undergoing evaluation and re-evaluation. Studying decision making in such contexts is quite frustrating, but if we are to be able to implement and predict the consequences of agricultural development we need to get a handle on such processes.

Adaptive Systems

Adaptive strategies that are successful over the long haul and that become adopted by large numbers of people within the group (having undergone what Bennett calls adaptive selection [1976: 294-5]) may be thought of as having become adaptive systems -- time-tested and widespread means by which groups solve the problems confronting them. The boundaries in time and space of these systems are imprecise, but they are what we generally refer to as cultures. These adaptive systems can be quite variable in how they respond to different ecological and social environments, a point nicely illustrated by Bennett's study of the Hutterites, Indians, ranchers and farmers who all have evolved their own distinctive styles of coping with the Great Plains of Canada.

Because these are systems that have evolved and survived over time, they necessarily involve the use of history in order to determine the processes that brought them about. It is in this more macrolevel realm that anthropological research and research influenced by anthropology has made great strides in the last two decades.

Geertz' study of the consequences of Dutch colonialism on Indonesia is still one of the best examples of such research (1963). He showed that as the Dutch used irrigated agriculture to produce sugar for export, they created an increasing demand for labor. This led to higher fertility rates on Java and to increasingly intensive work on family rice plots to feed the larger families. "This 'late Gothic' quality of agriculture increasingly pervaded the whole economy: tenure systems grew more intricate; tenancy relationships more complicated; cooperative labor arrangements more complex -- all in an effort to provide everyone with some niche, however small, in the over-all system" (Geertz 1963:82). The spiral that ensued led to what Geertz called involution -- increasingly complex adaptations of many aspects of social, economic, and cultural life to try to maintain an extant structure in the face of changed circumstances.

Historical research on processes that lead to major changes in adaptive systems has been influenced substantially by Ester Boserup's research. Boserup (1965) argued with then-conventional assumptions that agriculture came about because of some technological refinement or set of discoveries. Her interpretation was that the shift to agriculture was caused by necessity, perhaps borne of previous population increase. Her thesis is that when people deplete their environments and pass the point of diminishing returns, they change their technology to further intensify production. This hypothesis has been investigated by a number of anthropologists and nonanthropologists with somewhat mixed results (see Moran 1979:49 for a review).

Agricultural social science has discovered anthropology as more historians, social scientists, political scientists, economists and others adopt a more historical perspective on how agriculture and society have evolved together. In addition to Geertz, Sidney Mintz' (1985) research provides a model of the utility of such research. He demonstrated how the slave trade from Africa was used to shore up the plantations in the West Indies that produced sugar, the "cheap fuel" that helped to power the industrial revolution in England. Another "commodity study" using history as a tool to show how society and agriculture co-evolved to form distinctive adaptive systems is The Rice Economies (Bray 1986). Many of the books on "the political economy of" various regions of the world (e.g. Bulmer-Thomas 1987; Bates 1983) are doing much to inform us of how adaptive systems developed. Anthropological contributions like the recent book on Food and Evolution edited by Harris and Ross (1987) that seeks to determine the material bases for why humans eat what they eat are also positive contributions.

It is not surprising that the evolutionary perspective has been used predominantly in historical studies. Evolutionary theory in biology is also much more useful to retrospectively account for why change has occurred. Predicting the course of change is more difficult. There are, however, some useful guides for getting around this dilemma. One means is illustrated by Pingali, Bigot and Binswanger (1987) who have used Boserup's thesis in their investigation of why animal traction and mechanization has failed to take hold in Africa. Their research in a large number of sites indicates that most of sub-Saharan Africa has not yet reached the point where population density has made intensification, such as that using plows or agricultural machinery, appealing to farmers. They suggest that increases in population density, or alternatively the development of market access so that farmers can profit from more intensive production, will be needed before mechanization and other more intensive techniques take hold. Thus, there are some clear policy recommendations that arise from their study.

Another example of using the historical understanding of an adaptive system as a means for introducing change comes from the work of Murray in Haiti (1987). Responsible for designing and implementing a project that would help in the reforestation of many eroded areas of Haiti, Murray decided to look at the process as an experiment in "applied evolution." He based his plans on research that he and others had previously carried out on how the land use system of the island had unfolded since colonial times. His previous ethnographic research had also provided him with ideas about what a successful scheme would have to be like. Knowing that the Haitian peasant was highly

individualistic, he rejected community forest schemes. Knowing that the Haitian peasant was extremely poor, he knew that reforestation would only occur if the farmers saw that it could help them to improve their own economic circumstances. He used his knowledge of cultural evolution to discard attempting to sell reforestation on the basis of conservation. He wrote that an ancient food crisis caused by rising population was not solved by conservation measures, "... but rather by the shift into a domesticated mode of production" (1987: 237). The project implemented thus adopted the perspective of "domesticating" wood as a crop to be used in building houses, serving as a cooking fuel, and to be sold to others for those same purposes. The project achieved substantial success and is now being used as a model for reforestation efforts in other parts of the world. Murray writes about the project:

I felt as though I were observing (and had been a participant in) a replay of an ancient anthropological drama, the shift from an extractive to a domesticated mode of resource procurement. Though their sources of food energy had been domesticated millennia ago, my former village neighbors had now begun replicating this transition in the domain of wood and wood-based energy (1987:239).

It is too early to tell whether the adaptive system of Haitian peasants has changed to incorporate trees as a permanent part of their land use system. Revealing in this regard would be a study of the adaptive strategies of project participants, with an evaluation of the predictors of successful participants, and some estimation of the future success of these strategies. A decision making study has been done among participants, but I have not yet been able to obtain a copy.

What the Pingali, Bigot and Binswanger study and the Murray experience illustrate is that a historically-based study of land use patterns, along with an assumption that people are generally making good use of their resources under the constraints in which they live, can be a powerful tool for agricultural development planning. Many mistakes in agricultural development could be averted if such knowledge and assumptions were more widespread.

The Evolution of Agriculture

In some sense the ultimate question that can be addressed by using an evolutionary perspective is the extinction and survival one that I alluded to earlier. We have little to go on here but some of the answers to the question may be answered by beginning with the origins of agriculture. Archaeological and anthropological research within the cultural evolutionary tradition has enlightened us with a variety of interesting documentation and ideas concerning the domestication of plants and animals -- and especially the social, cultural, and demographic effects that this domestication set in motion.

V. Gordon Childe's writings (1951) on the changes wrought during the Neolithic are probably the most well-known. We forget that agriculture has been the basis of human sustenance for only a minuscule portion of our existence. Yet agriculture, which seems to have been independently discovered in Asia, Europe, the New World, and possibly Africa, enabled the human population to

begin its meteoric rise and to cause a multitude of changes in our social and cultural lives. Although there is some evidence that the transition to the Neolithic was initially accompanied by a fairly general decline in dietary quality (see M. Cohen 1987), the more long range implications included the rapid expansion of the human population. The estimated 5 million people about 6000 B.C. (Franke and Franke 1975: 157) now numbers a thousand times as much.

Archaeologists have documented the effects of the Neolithic Revolution in different parts of the world. The settling of nomadic people in villages and then larger agglomerations led to the increasing division of labor of society, of increasing social stratification, of writing and sophisticated numerical systems, monumental architecture, and a myriad of other changes. Agricultural scientists like Pimentel and Pimentel (1979) and Harlan have adopted a similar evolutionary perspective to write engaging, widely-used texts on Food, Energy and Society (1979) and on the relationship of Crops and Man (1975). We should remember that, in evolutionary time, the number of years that has elapsed since the domestication of plants and animals is very short. A recent article on diet and cancer, for example, suggested that we are, in essence, confronting modern diets with a stone age physiology (L. Cohen 1987).

The agriculturally-based societies of the Neolithic undoubtedly had an advantage compared with hunters and gatherers. And soon it became apparent that societies with more intensive agriculture had an advantage on those that depended on swidden techniques. Societies based on intensive agriculture expanded in terms of population. Those that developed means of social control to organize these larger populations were able to expand, conquer, and absorb their less fortunate neighbors.

If the Neolithic Revolution caused a multitude of changes, the urban industrial revolution has increased the rate and the effects of change. Until the 19th century, the vast majority of the world's population was rural and still engaged in the production of primary commodities. By the end of the 20th century, this pattern will have changed significantly. There will be several billion more people on earth, most will live in cities rather than in rural areas, and few will be engaged in the production of food. Agricultural technology has made these changes possible. Yet few researchers are attempting to look at what the potential social and cultural effects of this massive change in production patterns and population distribution will be. We see portions of these huge changes every day as we seek to cope with the massive migration of Third World people to urban areas, to deal with the massive unemployment and underemployment problem in Third World countries, and to attempt to equalize the massive surpluses of grains existing in developed countries with the malnutrition of millions in the developing world.

One of the few people who is attempting to examine contemporary society within an evolutionary context and who is attempting to predict the evolutionary consequences of the trends now occurring is Richard N. Adams. Adams sees humans using increasing concentrations of energy, power, and regulation to try to gain greater control over nature. Unfortunately, as humans have succeeded in gaining greater control over nature, they are creating new elements of what Adams calls the "macroframework." Hierarchy and market exchange systems (two of the primary mechanisms humans have evolved to gain greater control) thus

join non-human natural selection as the macroframework to which humans must adapt. The result is that "For the individual, the shift of controls from an uncontrollable nature to an uncontrollable hierarchy and market does not make things necessarily better. Things lodged in a macroframework are, by definition, beyond immediate control" (1985:65). This results in a greater need for regulation and control; in industrial society, about 15-20% of the total population is devoted to the control or regulatory function but even so, regulation is not very effective (see Adams 1985). Human societies are thus caught in an increasingly disordered state caused by the vicious spiral of creating more and more controls that are themselves uncontrollable.

Seen in this light, biotechnology is just one more attempt by humans to try to gain control over nature. Yet because of its nature, confining biotechnology to useful, productive purposes will probably require greater social controls. And, though the technology has great potential for addressing the needs of resource-poor farmers, it is likely that its effects will be directed first and foremost to the needs of those who will be most able to afford to purchase the technology. The already developed societies will have control over biotechnology and social control and the problems of underemployment, migration to cities, and increasing inequality are likely to be exacerbated. Yet little provision is being made for policy to deal with such effects, although the ultimate effects of continuing agricultural mechanization and biotechnology are likely to be more profound than were the changes wrought by the Neolithic.

I believe that the scope of issues that needs to be considered in looking at agricultural development should include an "archaeology of the future." This perspective would use evolutionary ideas and concepts to attempt to identify the short and long term consequences of the changes in adaptive strategies and adaptive systems that are being promoted under the rubric of development. Evolutionary theory does not contain any moral prescriptions for interpreting or guiding policy with regard to continuing agricultural change such as that of biotechnology. As Greenwood has persuasively argued, those who seek to derive moral lessons from evolutionary theory are using it only as a cloak to cover their own ideological positions (see Greenwood 1984). While the human manipulation of the cellular and genetic structure of plants and animals will undoubtedly have biological and cultural consequences, many of these consequences will be determined by conflicts and debates within and among human societies and groups, not by some ultimate purposiveness existing in natural systems.

Perhaps the only lesson to be learned from evolutionary theory is that, at least in the long term, variability is a good thing. Contemporary trends that are leading to increasing genetic and cultural homogeneity are probably not for the best -- at least in evolutionary terms.

Conclusions

Anthropology can be useful in broadening the range of issues that are considered in agricultural development circles. Their contributions range from microlevel studies that determine why individuals and households choose the adaptive strategies they do, to documenting the reasons why adaptive

systems have evolved, to the macrolevel questions of the ultimate evolutionary consequences of these adaptive systems (see DeWalt and Pelto 1985). In order for anthropology's contributions to be greater and more effective, there will have to be change both on the part of anthropologists as well as within the larger agricultural establishment.

Anthropology should change to bring greater attention and importance to issues of contemporary importance in agriculture. This change has begun with more and more anthropologists addressing such issues. Too often, however, the anthropologist still frames his or her arguments in terms relevant only to a small number of other anthropologists. Esoteric debates on formalism and substantivism in economic anthropology, on the potential human nutritional contributions of Aztec cannibalism in ecological anthropology, and the attention the general profession has placed on whether Margaret Mead's 1920s studies of Samoa were accurate, are not likely to gain the discipline much credibility in dealing with more practical issues.

Unfortunately, disciplinary issues still dominate larger debates concerning agricultural and food policy. Despite the recognition that complex problems require a variety of perspectives and teamwork to solve them, and despite all of the pleas for multidisciplinary cooperation and operation, there are still too few rewards to allow professional people to actually perform in such a manner. To be sure there are some steps being taken in this direction. The Kellogg grants to establish programs like that in Agriculture and the Humanities at the University of Florida, and the Food, Energy, Agriculture and Society in Transition (FEAST) program at the University of Kentucky, and similar programs elsewhere are positive. Yet multidisciplinary programs everywhere seem to depend on either outside funding and/or a charismatic, dedicated leader to keep them going. Until the reward structure of institutions like land grant universities changes to bring multidisciplinary groups together, substantive changes are unlikely to occur.

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STUDIES OF HOUSEHOLDS REVIEWED IN RELATION TO FARM AND HOME,
BALANCED FARMING, FARMING SYSTEMS AND FARM MANAGEMENT
PROGRAMS AND STUDIES IN THE COLLEGE OF AGRICULTURE

CORNELIA BUTLER FLORA*

Introduction

Within U.S. colleges of agriculture, farm management is currently the dominant paradigm linking the technical knowledge derived by researchers to farm families. As it is now practiced, farm management is both a field of research and an extension tool. Farm management research calculates the economically optimal application of agronomic and animal technology in a way to maximize market yields. The goal is to make money in the farm business by manipulating as efficiently as possible all the variables under the farm manager's control (Kadlec). While early work in farm and home and balanced farming included calculations of long term sustainability, perhaps because agronomists were the early innovators in developing farm management as a separate specialty, current farm management texts stress calculation of yearly profits and equity accumulation (net worth), with only lip service to questions of resource deterioration. Farm management has now become the exclusive purview of agricultural economists.

Farm management includes the implicit assumption that a

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major goal of the farm family (assumed to equivalent with the goal of the male "farmer") is to maximize net worth. Capital expansion, including the acquisition of land, implying an ever-decreasing number of farmers, is a major means to that goal. A rapid survey of farm management textbooks over time suggests that only since around 1982 was "cash flow" included as a goal. Both these goals, net worth and cash flow, as indicated by the measures used, have a very short term time horizon, as they follow the basic business principles of other U.S. enterprises -- accounting procedures that may in part account for the problems U.S. industry is now having in world competition.

Farm management assumes a market orientation and commercial agriculture. While farm and home and balanced farming assumed a family farm, with non-capitalist relations of production as the farm family neither bought or sold labor, farm management assumed a movement toward a capitalist agriculture, with hired labor as well as farm machinery replacing the physical labor of the farm manager. All of the three approaches were innovative in moving beyond yield per acre by including economic costs, but each took technology development as given. While in the 1950s, balanced farming and farm and home focused on the need for flexibility in the organization of multiple farm enterprises under conditions of market uncertainty and long- and short-term planning opportunities, current practice seems much less concerned about variability in household vulnerability and

how that differential vulnerability might influence farm management recommendations.

Farming systems as an approach was initially established in developing countries, including those of less than optimal conditions of production (Norman, Collinson, Bradfield, Hildebrand). Not only were at least part of the farms involved producing a substantial portion of their output for domestic use, but harsh climatic conditions and unreliable rainfall, especially in Africa, meant that the "appropriate" technology was not necessarily on the shelf for the farm management expert to work into the regression equations. As a result, farming system research focused not only on what farmers (and later farm households) should do to maximize their goals, which were gradually expanded from narrow economic and agronomic indicators, but what production scientists should undertake in the way to research (Conway). Farming systems research attempted to make the household a part of the research team, not only through on-farm trials, but in setting research agenda (Caldwell and Lightfoot). As such, researchers were forced to think beyond the farm to the producer, and to realize that in a great many farming situations, the relevant unit was not the male farmer, but the household, and that members of the household might have different goals. A farming systems approach led researchers to realize that farming objectives may vary for different commodities in different

parts of the farm and that the objectives of different individuals within the farm household may vary (Okigbo).

Given that the generalized goal of all these approaches is to increase the well being of farmers, and that farmers are located in households that are also production units, what can social science studies of households contribute to understanding farmer behavior and explaining the relations between policy, technology and rural welfare? Do such studies have a contribution to make to studies and programs in U.S. colleges of agriculture today? .

Households in Agriculture

Much of the work on agricultural households has been done in developing countries. While that limits exact comparability of study results to what might be found in agriculture in the core countries, such studies do introduce a number of important components that could be integrated into studies and programs in U.S. colleges of agriculture. This paper attempts to use that literature to suggest ways in which current programs could be strengthened.

Although there is an extensive anthropological literature on the definition of the household (Guyer 1981, 1986; Harris, White, Yanagisako), this paper will focus on the strengths of using the household (instead of the contemporary U.S. term, the family) as a tool for research and applied programs. One important insight from the household definition literature is that what constitutes the

household can vary considerably depending on definition; i.e., do we mean a unit of consumption, a unit of production, a unit of investment, or a group united by a variety of kin-based obligations and rights? Further, households change radically over time. Just as households in developing countries can vary depending on the definition used (Jones, Peters), so can households in the U.S. If we define the unit inappropriately, we are likely to come up with results that cloud, rather than clarify the phenomenon we are examining. For example, we may be using an entirely inappropriate definition of household when we look at farm survival if we do not use a household based on shared risk and shared investment. Many of the older farmers that are in serious financial difficulty became exposed financially by underwriting their children's expansion or entry into farming. If we define the household as the nuclear family, we miss key elements of family farm survival.

When is the household a relevant unit?

The household can be an appropriate unit of analysis in agriculture where there is a market economy , but before the farming enterprise becomes totally capitalistic, with the separation of the factors of production and the presence of hired management and labor. Studies in various parts of the world (Collins, Guyer 1981, Kahn) suggest that the household becomes the relevant social unit for production and survival only when a group becomes integrated into wage and commodity

markets. Prior to this integration, mutual interdependence among many members of the community, reinforced by rituals, shared labor, land, and agricultural inputs makes the household much less important as a unit of analysis or for initiating change. When there are not linkages to larger markets through the sale of labor or products, particularly when resources are scarce, networks of nonhousehold productive relations provide access to the resources for subsistence agriculture, including the deployment of labor (Collins, p. 654). Such extra-household interchanges compensate for small farm size and cyclical labor shortages. In contrast, in situations where all labor is hired, the household's primary function becomes that of reproducing and sustaining the labor force.

The household is production-relevant and internally consistent only in certain historical and economic circumstances. Studies and programs in the college of agriculture should look beyond the household to community and larger kin- and friendship based networks, as well as within the household, to determine under which circumstances individuals act collectively, separately, or in opposition.

Extra-Household Considerations

Studies of the household also point to the importance of exchange relationships for survival, and make clear that exchange relationships involve complex interdependencies that go far beyond the limits of the household. As a result

of extra-household interdependencies, individual members may make decisions based on gender-based affinal ties. These obligations may appear economically irrational at a single point in time, but taken over the life cycle, serve as a source of labor and capital for production and domestic needs. Indeed, for farm families in the United States, it might mean that farm, non-farm exchange relationships that are both kin and affinity based may be more important for farm survival in times of crisis than any particular management decision on the farm.

How do we know about households?

Studies of households in developing countries point out the limitations of existing data gathering techniques for understanding what goes in agriculture. Most of the current techniques for measuring labor force participation were designed in response to high unemployment, based on the assumption that each individual had one (and only one) source of income, generally from wage labor. Such data gathering techniques, and the reliance on such data common in our colleges of agriculture, have as their basic premise that each person has one simple formal link to the economy and receives direct payment for that activity. Such statistics distort the intra-household contributions to agricultural production, as well as disguise multiple survival strategies within households. Studies of households which compared finding based on careful household

and within household measurement to official data sources question the accepted methods for gathering data on rural labor force participation (Berneria, Buvinic, Rossini, Deere, Santu, Hoffman and Sciara, Dixon).

Approaches to the Household in Agriculture

A major theoretical issue addressed in the new household studies is how a non-capitalist form of production (either peasant production or the family farm) manages to maintain itself in an economy dominated by capitalist relations of production (Long). Both modernization and Marxist theorists have predicted the demise of such petty capitalist production forms as represented by family farm operations. Much of the research on the agricultural household documents the ways pre-capitalist relations of production coexist with capitalist relations of production. Configurations within the household are key to the survival of family farms in such situations, providing unpaid labor, subsistence production, and capital through off-farm work (Schumann, Kervin). Understanding the balance between multiple income strategies within the household helps explicate differential labor availability as well as differential solutions to labor and capital constraints.

Household studies have addressed the contradiction of the maintenance of family farms from two perspectives. One perspective assumes that there will be an increasing differentiation of the rural population into land owners and

workers. These studies view the growing number of household members seeking off-farm work as the beginning of a transition to full proletarian status. The development of other household diversification strategies, such as diversified crop production and crafts, are a part of this transition process (Archetti, Archetti and Stolen, Cliffe). Indeed, this Leninist view might well characterize the approach taken by many U.S. colleges of agriculture in their research and programs, as they tend to dismiss small and part-time farmers as outside the domain of their mandate, which has become defined as producing food and fiber as cheaply and in as great quantities as possible. Smaller farmers are thus viewed as in transition out of agriculture. This view is reinforced by the major agricultural organizations, particularly commodity groups, which tend to be dominated by large growers, for whom the household serves an ideological function when arguing to save the family farm (Flora 1981). Much research in agricultural economics buys into the "decomposition" argument by stressing the need for farmers to get bigger or get out of farming.

The other approach stresses the intensive use of non-wage household and extra-household labor by farm households that make them competitive in an economy dominated by large capitalist firms (Friedmann). Most household studies follow this approach, looking at resource use within the household and the types of cognitive orientation and economic rationality that facilitate and motivate households to

remain in farming, despite getting the majority of their income elsewhere and despite the tendency noted by Chayanov to exploit their own labor. Values and meaning structures are therefore much more important in these types of household studies. U.S. colleges of agriculture in both their research and programs would do well not to assume that all actors in a given rural situation share the same meaning for similar actions or events, and to investigate more fully how the values of scientists and extensionists may differ from those of different kinds of households and different members within those households.

Intra-Household Issues

Decision Making and Power

Most traditional studies within colleges of agriculture have viewed the household in a relatively undifferentiated fashion, ignoring issues of gender and age. When rural women were considered at all, researchers and practitioners viewed them as either totally and unquestionably subordinate to men, who were the logical representatives of familial interests, or as clever, behind-the-scenes manipulators. The presence of elderly and young people seemed a temporary phenomenon, as brief guests until financial independence could be attained. In the U.S., studies of decision making within the household, building on the urban-based studies of Blood and Wolf, began to look at production decisions as well as the urban biased focus on consumer and labor force

decisions (Wilkening and Morrison, Wilkening 1958, 1981, Burchinal and Bauder, Wilkening and Bharadwaj, 1967, 1968). The focus was almost entirely on the husband and wife, although a few studies looked at the interaction of generation and gender (Salamon and Keim, Rogers and Salamon, Salamon and Lockhart). Awareness of the importance of multiple household members as decision-makers had little impact on the structuring of either production-oriented extension or farm management research and practice. Decision-making was not tied to control of resources (beyond Blood and Wolfe's use of differential education and income within the family as indicators of differential power). It was only when a growing number of rural households were without men that the intrahousehold access to and use of the factors of production were addressed (Buvinic and Youssef, Chaney, Abbott, Ehlers). Programs and research in U.S. colleges of agriculture could benefit from attention to the implication of different household structures for not only who performs specific productive labor, but who makes the decisions concerning that labor and who controls the profits of that labor.

The new scholarship on agricultural households questioned old concepts of homogeneous rural family structures and unified family-centered production processes. Stolcke, among others, questioned the notion that the family is a "collectivity of reciprocal interests, a pooling of efforts for the benefit of all members" (Stolcke, p. 265).

There are many productive relationships that divide, rather than unify family members (Collins). Indeed, an intensive household study by Phillips suggests that households should be viewed as arenas of struggle between generations, genders, etc., rather than an harmonious, finely tuned machine working for the collective good.

Changes in Households and the Structure of Agriculture

Research looking within the household makes clear that power relations within the household have changed as the rural economy has changed. (Aranda Baeza, Babb, Hewitt de Alcantara, Roldan, Rubbo, Wilkening 1981). Colleges of agriculture need to give more attention to the interaction of household dynamics with the larger economic structure in order to make programs and reseach fit the emerging needs and potentials of households in rural areas. Further, studies and programs in colleges of agriculture need to look beyond who does what work (division of labor) to who controls the fruits of that labor (division of resources). As the economic relations change, so does the willingness of wives, sons, and daughters to unquestionly hand over either their labor or their earnings. Colleges of agriculture need to begin to address the implications of growing vertical integration in agriculture, the increase in contract growing, the movement of management decisions off the farm, and the degree to which all these effect and are effected by different types of households and intra-household relations.

The impact of shifts in the structure of agriculture on household dynamics have been well-documented by household studies. These studies suggest that it is not the labor performed by each household member that is critical, but the labor relations under which they are performed that influence whether members of the household accept patriarchal authority or resent patriarchal privilege. Stolke, in looking at households over time in rural Sao Paulo coffee production, demonstrates how share cropping was much more acceptable to women than was wage labor, although women did the same work in both kinds of labor relationships. The importance of whether or not an agricultural enterprise is defined as a family enterprise may mean that family will make the consumption sacrifices necessary to remain in farming through hard times will decline more rapidly than anticipated. While family incorporations may have little meaning on who owns the land, an examination of family corporations may reveal that they are written contracts among male relatives, in essence excluding women from their previous decision making roles in the interest of family harmony.

The Importance of Relations of Production

Studies that link the relations of production to household structure emphasize the importance of petty commodity production, where the farm family neither buys nor sells labor, in motivating the entire household, both on and

off the farm, to provide capital and labor for the enterprise. Studies in U.S. colleges of agriculture would do well to look beyond land ownership to other mechanisms of integrating the farm household into a capitalist mode of production. Studies of the poultry industry and its impact on households, suggested by Heffernan, would be a good place to start in removing simplistic opposition to corporation farming as the populist weapon in the struggle to "save the family farm". If relations of production are separated from the dominant mode of production when the farm household is examined, the variety of ways capitalist firms extract surplus value from agriculture could better be analyzed, as well as the benefits and costs of maintaining such relationships for the farm household.

Much of the anthropological research on households has examined how changes in the relations of production affect gender and generational relations. Such research shifted focus away from the individual or family as units of production to the intrahousehold division of labor, division of responsibilities, and division of resources (Poates et al).

The Household as a Source of Labor

The work of Chayanov on the Russian peasant alerted researchers interested in labor availability to the importance of household life cycle to farm management decisions in developing countries, focusing on which family

members provided what labor under what conditions (Garrett and Espinosa, Bouquet, Friedmann, Arriagada and Noordam, Deere 1977, 1978, 1983, Deere and Leon). Work in the United States has suggested that family farmers plan their farming operations in light of the labor available at different stages in the household life cycle (Vidich and Bensmen, Salamon and O'Reilly). Tienda, looking at the household in Peru, suggests a reverse causality -- that households expand through a variety of fictive kin arrangements when labor needs are high, and respond by expelling members when opportunities of generating household-linked income declines.

The Household as a Tool in Defining Agricultural Research

Studies including intra-household considerations help explain agricultural strategies that maximize income, minimize risk, and maximize return to labor (Tripp, Maxwell). A farming systems approach, which requires interaction among social scientists and production scientists, when coupled with an awareness of intrahousehold issues, provides a powerful tool for both commodity-specific research and the development of alternatives that meet the specific needs of different types of farmers with different resources available. U.S. colleges of agriculture have, up to this time, have used agricultural economics to help design field trials in order to determine the optimum level of inputs to achieve the highest monetary output per acre.

The household literature, particularly that related to farming systems, suggests that involving other social scientists could alert production scientists to key issues in breeding, cultural practices, and crop mixes that might increase the utility of their research for a wide variety of farm families (Poates et al., Flora, Feldstein).

An interdisciplinary approach utilizing intrahousehold considerations that might be adopted by U.S. colleges of agriculture to better research and extend knowledge to improve agricultural welfare involves analyzing constraints, types of household with different resources to overcome constraints, and working with appropriate members of a household to test technologies which are compatible with their resources to overcome those constraints.

The Importance of Separate Enterprises with the Household

Identification of gender-based management roles in animal and crop production maximizes research efficiency as well as facilitates extension effectiveness (Fernandez and Salvatierra). Changes in the scale of animal production, in particular shifts in relations within the household, reduces women's traditional dominance in animal production (and the household's flexibility to adjust to shifting commodity markets), and increases the dependence of the household on a single source of cash income, without the resulting subsistence savings (Hecht). The concentration and inequalities that result from assuming that males within the

household are responsible for all production decisions is documented in the U.S. as well (Fink). The increased inequality within the household related to production of a single export crop is reinforced by household studies focusing on agricultural crops (Rubbo).

Studies of households document how economic specialization, especially export agriculture, changes the traditional divisions of labor within the household (Aranda and Gomez, Deere and Leon). These shifts have also been suggested by household studies in the U.S. Much of farm management, despite the increased use of the gender-neutral term "farmer" instead of "the farmer, he", does not systematically analyze the differential inputs within the household by gender and age. Gender and age-specific inputs and expectations have enormous implications for farm survival and farming strategy employed. For example, Salamon has shown how households of different ethnic backgrounds choose different farming strategies, resulting in different farming systems and different divisions of labor within the household -- even in the same agro-ecological area of Illinois (Salamon and Davis-Brown).

Rural Development and the Household

Household studies in developing countries have examined the impact of off-farm work. Household studies in Mexico (Young) and Chile (Campana and Lagos) demonstrate the disadvantages to the household when such work is seasonal

and piece work. In contrast, Blumberg found in Guatemala that the whole agricultural household welfare was more positively influenced by female off-farm work than by male off-farm work when their wages were high and working conditions stable. Colleges of agriculture need to systematically look at the interplay between on-farm and off-farm work of different family members under different conditions of employment. Household research to date suggests that the nature of off-farm employment sought by various members of the families throughout the year is crucial in determining the success of changes in farming systems and in predicting the impact of different kinds of economic development on rural communities.

What Changes Could Household Studies Bring?

Most programs in U.S. colleges of agriculture have taken an implicitly Leninist stand, assuming the ultimate transformation of family farms into capitalist units of production, where land, labor, management, and capital all come from different sources. As a result, households have been relegated to reproducing and caring for the ever-decreasing labor force required by production agriculture. Household studies have been equated with what women do. The farm crisis has given new appreciation of the household as a buffer between the male farmer and the larger society, but that buffer tends to be defined as emotional rather than economic. For example, the family has been seen as helpful

in helping a male farmer make the "choice", described in farm management texts as early as the 1950s, to leave farming. For these researchers, teachers, and extensionists in colleges of agriculture, the disappearing middle is proof of the ultimate demise of family farming as petty commodity production. The move will be toward more substitution of capital for labor, including household labor. More specialized -- and less specialized -- labor will increasingly be hired to replace household labor, including custom planting, IPM, and harvesting, as well as management services, which tend to disguise the sharp shift in the relations of production from small businesses to the dependence on selling of labor for survival. The household is a given in this scheme. Efficiency, marketing, and other management techniques are assumed to be either irrelevant to the household or to be implemented by the household working as a team. Small farms from which most household members work off farm will be viewed as disguised proletarianization, with the identity as wage worker taking precedence over identity as farmer (Mintz, Rosenberry).

Researchers that adopt a framework that confronts both neo-classical economics and traditional Marxist theory are much more likely to look within the household and see many more options for households in the face of modern economic challenges. Such research can help widen the options for rural household by stressing the relationship of farm and off-farm work, not that one substitutes for another. Such

an approach means substantially different policy directions as well. Agricultural production research would be redesigned to take into account not only the currently organized pressure groups, but the needs and strengths of various types of households and configurations within households. And policy at the national level would be shifted from an agricultural policy to a rural development policy, recognizing the historical ubiquity of diversified household strategies.

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PEOPLE, PROCESSES, AND PRODUCTS: POTENTIAL CONTRIBUTION OF
THE SOCIAL SCIENCES TO THE PRESERVATION AND ENHANCEMENT OF
NATURAL RESOURCES IN THIRD WORLD COUNTRIES

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A decade ago Walter Firey (1978) noted that the condition of a farming community and the condition of the soil are interdependent. The principle holds more generally for the condition of natural resource-dependent communities and the state of their resources. Increasingly development scholars and practitioners recognize that the degradation of natural resources is both a cause and a consequence of deteriorating social conditions. The litany of environmental woes is familiar--desertification, erosion, siltation, flooding, deforestation, salinization, and loss of soil fertility. The symptoms of human misery are equally familiar--famine, malnutrition, high infant mortality, short life expectancy, exhausting workdays (particularly for women), high morbidity, illiteracy, fragmented families, indebtedness, landlessness, the fuelwood crisis, and violence.

In this paper we explore the question of the role of social science in addressing the intertwined issues of natural resource preservation and management and the elimination of rural poverty. Because of the agricultural focus of these meetings, we have limited our attention to soil, water, grazing, and trees because they are integral parts of agricultural production systems, although air, minerals, oceans, fish, and wildlife are also resources worthy of attention. Because forests serve ecological

functions essential for the sustainability of downstream agricultural production and because forest and tree products are significant components of rural livelihood and production systems, social forestry is included in this discussion.

The Problem of Defining Problems

Is the world going to an ecological hell in a handbasket? There is no doubt that there are several areas of the world where environmental deterioration in the forms enumerated above pose a real and sometimes immediate threat to present levels of production and quality of life. Many areas in sub-Saharan Africa fall into this category. Increasingly in these areas, extensive systems of production that were sustainable under lower population/land ratios are coming under stress and the need for intensification is becoming apparent. And yet as Thompson et al. (1986) and Blaikie (1985) have pointed out, there is by no means consensus over the cause, extent, or long-term prospects of environmental degradation. For example, while many call swidden (slash and burn) cultivation a systematic and ecologically sound form of agriculture, foresters are likely to call it devastation. Foresters, in turn, regard clearcutting as a sound forest management practice, while others call it devastation.

We do not propose to enter the lists of these debates here. Rather, we begin from the simple premise that in many places things are not as they ought to be ecologically, that the elimination of rural poverty and the sustainability of agricultural production depends on making them right, and that

the protection and enhancement of natural resources depends on the elimination of rural poverty.¹

Problems in Past Analyses and Strategies

Past approaches to the problems of natural resources, rural production systems, and rural poverty have not always been satisfactory. In some cases the analysis of the problem was wrong. Hence, strategies based on the analysis were ineffective. In other cases, while the analysis was reasonably correct, the strategies stemming from the analysis had unanticipated adverse consequences. An initial contribution of social science to the processes of protecting and enhancing natural resources has been the identification of the errors in these assumptions and the adverse effects of these strategies.²

Analytical Assumptions

Four assumptions stand out as problems in past approaches:

- (1) the assumption that the issue was a production problem,
- (2) the assumption that the problem was overpopulation
- (3) the assumption that a particular resource could be used, managed, and analyzed in isolation from other physical and community resources,
- (4) the assumption that environmental degradation was the result of the "tragedy of the commons".

For very good reasons early development efforts were focused four-square on raising production. The need was clear and the techniques for addressing the problem known and available. Production was a reasonable place to start. Even critics of the

Green Revolution acknowledge its successes. For example, Scott (1985), who details many adverse effects of the introduction of high-yielding varieties, especially when associated with mechanization, also notes that now no one goes hungry in the Malaysian village he studied. Nonetheless, the assumption that by increasing total production, a surplus would be generated for improving the lives of producers and for investing in their production systems has been found wanting on a number of fronts.

For one thing, increased food production is not necessarily a solution to alleviating hunger; improved access to the enlarged food supply is also critical (World Bank, 1986). Furthermore, as discussed below, the long-run success of agricultural development in reducing rural poverty depends on the structural transformation of an overwhelmingly agrarian economy. But clearly, unless the growth of agricultural production is associated with growing domestic demand or expanded exports, the value of a product be it cash crops, timber, or fuel wood, is likely to fall as production increases, leaving the producer no better and sometimes worse off than when she started. This, in turn, may force her to practices which lead to further resource degradation (Blaikie, 1985). In addition, the focus on production has often tended to lead to a skewed distribution of benefits to the elite and high potential regions where the most significant production gains could be made (Hammer, 1982; Agarwal, 1985; Scott, 1985). As a forester explained when asked why the benefits of a social forestry project was going to very rich farmers:

The measure of a scheme is its target. Now if the poor are not able to do the scheme because it is not suitable for them, then the scheme has to go to the rich so the target can be achieved. (Mahiti Team, 1982.)

Finally, the focus on production and a fixed idea of how it is to be achieved has sometimes masked environmental costs--erosion, flooding, and siltation (Mishra and Tripathi, 1978), loss of genetic diversity (Plumwood and Routley, 1982), loss of wildlife habitat and with it food sources, and ironically sometimes loss of production (Callahan, 1987; Weber, 1982; Freeman and Resch, 1985/86).³

"Overpopulation" has been popularly blamed for environmental degradation and rising levels of poverty. The apparent link between "overpopulation" and environmental degradation masks a more complex set of dynamic forces. In some places, including much of sub-Saharan Africa, sparse population may militate against the use of labor-intensive conservation practices and preclude the development of an adequate transportation network and other infrastructure. In other places, the effects of rising levels of population are aggravated by skewed distribution of resources. For example, in Latin America, the concentration of land in the hands of the few has forced the poor onto more fragile lands. When large landholders are, as is frequently the case, politically powerful, the "overpopulation" argument is used to prevent or avoid attention to the equity dimension of the problems (Durham, 1979).

A more careful look at the "population problem" suggests that the most significant problem is not the static situation reflected in the existing population/land ratio but rather the rate of population growth. Under a condition of steady but slow population increase, rising food needs tend to lead to intensification and innovations in the farming system (Boserup, 1965; Pingali, Bigot, and Binswanger, 1987). The outcome of such a process reflects the quality of the natural resource base; the availability of land, labor, and capital; the existence of markets for selling produce and for buying inputs; and local management skills and cultural values. Netting (1968) has documented just such a historical process of intensification among the Kofyar of highland Nigeria. In contrast, extremely rapid rates of growth can overwhelm production and management strategies as well as local institutional capacities even where the ratio of people to land is low and, as in much of Africa, skewed land distribution is not a serious problem. But the current rates of population growth in Africa, which run as high as 4 percent in Kenya, are much higher than the 1.0 to 1.5 percent rates of growth that induced technological change during earlier demographic transitions. Such rapid growth rates also exacerbate the problems of expanding employment opportunities in pace with the rapid growth of population of working age and of increasing per capita investment in human and physical capital.

It has frequently been assumed that resources could be considered in isolation. Yet many resources are of limited value in isolation as is the case of land or grazing without water or water without land or grazing (Romm and Fortmann, 1987). The analysis of isolated resources generally excludes local definitions and uses of natural resources and thereby masks adverse effects in the encompassing ecological and social systems. For example, when the focus is simply on teak, logging a tropical rainforest may appear to be a profitable and reasonable use of the resource. However, when environmental effects on the area as a whole and the loss of swiddening products are considered, the figures on the balance sheet change considerably (Dove, 1983).

A corollary of this assumption is the belief that by focusing development on one component or commodity in a system, greater advances could be achieved than by attempting to improve multiple parts of the system simultaneously.⁴ In the 1960s and the early 70s, major efforts were made to increase the productivity of rural producers using technology as the primary intervention. In the process of creating conditions conducive to the adoption of such technologies, the rest of the production system was often neglected and producers lost the ability to maintain a diversified production system and became more vulnerable to climatic and socio-economic fluctuations. Indeed, in some cases, essential natural resources which contributed to the production system were destroyed as when extension workers

urged farmers to clear trees (often nitrogen fixers as well as being sources of fuel, fodder, medicine, shade for cattle and humans, food, and wood for farm implements, house poles and fencing) out of their agricultural fields. This approach tended to view peasants as ignorant and ineffective managers of their environment and failed to recognize the nature of local farming and resource management systems. The work of David Brokensha et al. (1980) and Paul Richards (1985) has demonstrated to the contrary that traditional systems of farming and resource management are both complex and rational.

On the basis of some seven years of research as an ICRISAT regional economist in Burkina Faso, Matlon (1985) has been led to stress the fact that only a small percentage of cultivators are currently in a position to adopt input-intensive technologies because they face such a severe cash income/purchasing power constraint. Therefore, for agricultural research to be relevant to short-term objectives, it should stress innovations that require only very small cash outlays for off-farm inputs. He recognizes, however, that the potential increases in output and productivity that can be realized by such a strategy are quite limited so that in the medium and longer term research will have to develop and promote innovations such as crop varieties selected for their capacity to respond to higher levels of soil fertility and therefore requiring substantial application of chemical fertilizers. As discussed below, thinking in terms of efficient sequences of innovations to bring about the transition

from extensive to intensive farming systems underscores the importance of identifying feasible and profitable short-term innovations for improving soil and water management that will yield modest immediate gains in productivity while increasing the returns to subsequent adoption of more cash-intensive technologies.

Finally, the acceptance of the premises of Hardin's (1968) theory of the tragedy of the commons has had serious effects on thinking about natural resource protection. Hardin asserted that resources held in common were inevitably overexploited and degraded. This argument was based on the assumptions that common property (from which exclusion is possible) is synonymous with open access property (from which exclusion is not possible) and that decision-making is individualized and based on an economic maximizing strategy. The assumptions of the tragedy of the commons have repeatedly been refuted with empirical evidence (Gilles and Jamtgaard, 1981; Panel on Common Property Resource Management, 1986). This is not to suggest that there are no degraded commons, only that Hardin's explanation is erroneous.

Strategic Shortfalls

These analytical assumptions have been mirrored in the field by strategies which have had adverse effects on natural resources.

To view resources in isolation from the encompassing ecological and production systems can have the effect of promoting extractive production processes which not only deplete

the supply of the particular product but also reduce the stability and productivity of the entire system (Dahlberg, 1979). It also has led to exclusionary strategies of protecting natural resources. Foresters, for example, have long tried to protect forest reserves and plantations by excluding local people who often had used the forest for millennia not only for timber but also for grazing, food, medicine, and wildlife.⁵ The result has been reduced standards of living for local people and/or increased pressures sometimes followed by degradation of alternative sources of the resource. At times violence ensued as rural people fought to regain control of their land (Guha, 1985a, 1985b). The failure (or refusal) to recognize that a resource is part of a system of use may also have exclusionary effects as in the conversion of pastoralists' dry season and emergency pastures to arable agriculture by colonists and non-pastoralists.

The assumptions of the tragedy of the commons have led to strategies of tenurial change. One such strategy is privatization which can have both ecological and social effects that are adverse. Some resources are not easily divisible. For example, where the time and place of rainfall is unpredictable as it is in many arid and semi-arid areas, cattle producers must have the flexibility to go to where the water and grazing are. Privatizing such a resource either means locking people onto smaller units of land which may at any given time have none of the required resource at all, with predictable effects on both the resource base and the producer's economic well-being, or it

means giving large units of the land to a few people, thereby dispossessing the rest. Another consequence of privatization may be the loss of resources located only in communal areas. For example, Brokensha and Njeru (1977) and Brokensha and Riley (1978) note that honey production plummeted ("bee trees" were generally located on the commons) and sacred groves (which serve important ecological functions) began to disappear after land privatization in Kenya. And finally, unless the existing system of land rights is very clearly understood, some groups, particularly women are vulnerable to losing their rights in the process of privatization and registration of land (Okeyo, 1980).

A second strategy arising from Hardin's thesis is governmental control of the resource. The classic case of how this strategy can go wrong is the nationalization of centuries-old village forests in Nepal which rapidly resulted in deforestation (Thompson et al., 1986). When the forests were returned to village control, village forest management resumed.

It was noted earlier that increased output of agricultural products sometimes leads to a sharp decline in prices and a reduction of producer incomes because the elasticity of demand for agricultural commodities is often less than unity. A glut of supplies leading to a sharp price decline is especially likely to occur in isolated areas where markets are thin. In addition, it is commonly alleged that small-scale farmers are exploited by middlemen. A common response to a legitimate concern with price stability and to the dubious allegations about the monopoly power

(or inefficiency) of middlemen has been government intervention to set up a marketing board to influence or control the marketing of major food products. Especially when such marketing boards have been established with a statutory monopoly, the outcome has had very detrimental effects on farmers. Because of the inflexibility and other characteristics of a governmental agency, marketing boards tend to have high fixed and operating costs. Furthermore, there is a common tendency for marketing boards to hold down food prices, with adverse effects on producer incentives, because politicians in LDCs tend to be more responsive to city dwellers, a visible and vociferous force, than to the more numerous but more inert farm population.

Government agencies with the more limited mandate of reducing the magnitude of price fluctuations by managing a buffer stock are more likely to yield net benefits. If, however, the "price bands" that are set to trigger purchases or sales by the agency are not fixed on the basis of a careful and reasonably accurate analysis of the consequences of the trigger prices that are selected, it is highly probable that the intervention will be very costly so that the costs are much greater than the fairly modest benefits from stabilization (Newbery, forthcoming).

The only real solution to the problems that arise because of sharp fluctuations in the agricultural sector's domestic and export prices lies in progress in transforming the structure of a predominantly agrarian economy in the direction of a more diversified, more productive economy with greater capacity to

adapt to and cope with price and other economic fluctuations. Unfortunately, it is not possible to rapidly transform the structure of economies characterized by a rapidly growing population of working age of which some 50 to 80 percent still depends on agriculture for income and employment. Earlier hopes that comprehensive planning and Soviet or Maoist approaches to a command economy or a "Great Leap Forward" might permit shortcuts have been dashed. What has become increasingly clear is that successful development requires "a generalized process of capital accumulation" with capital broadly defined to include not only physical capital but also human capital and capital in the form of economically useful knowledge and an array of effective institutions, both public and private. Thus the specialization that is so crucial to economic progress not only includes the specialization of economic activity as individual firms become more specialized but also the functional differentiation promoted by the creation of educational institutions, research institutes, and other institutions that generate and foster the technological change that leads to economy-wide increases in "total factor productivity"--that is, in output per unit of total inputs. (See Johnson, 1969; Kuznets, 1971; Johnston and Clark, 1982).

The Need for Social Science

Some of the problems we have identified above are the result of relying primarily on physical and biological sciences and on scientists and practitioners from those sciences to lead the way in designing development policies and strategies. Experience in

other areas has shown that the inclusion of social science theories, questions, and methods can increase the chances for success and decrease the adverse effects of development policies and strategies. The on-going saga of environmental troubles demonstrates the need to bring social science expertise to bear in the arena of natural resource management as well. Social science has a role in improving the framing of questions, in providing information on social aspects of the problem, and in guiding the implementation of development policies and strategies.

The first area in which social scientists can make a considerable contribution is in a more careful framing of the problem. While not all rural poverty is resource-related, a significant portion is. Thus, a first step would be to differentiate the kinds of natural resource-related poverty so that decision-makers can respond with diverse policies and strategies to the diversity of causes. Four general causes of natural resource-related poverty can be distinguished:

(1) **lack of access to a resource** because the supply of the resource is inadequate or because the distribution of control and access rights are skewed;

(2) **insecure access to a resource** due to natural calamities (hurricanes, volcanoes, landslides), skewed distribution of control, the operation of property laws, for example, eviction of tenants or nationalization of land, change of status within a household (e.g. when women are widowed or divorced), breakdown of

or lack of accountability in civic culture, and change in the value of the resource;

(3) resource degradation due to inappropriate technology, an inadequate resource base for the population, greed and inadequate regulation, skewed resource distribution, resource fragility, and natural calamity;

(4) Low return or damage from a resource owned by another due to weak labor laws or nonexistent or weakly enforced regulatory laws.

The most striking thing about this list is that relatively few of these causes can be addressed with technical fixes. Rather we are looking at questions of social relations--distribution of rights to resources, the enforceability of rights, value, equity. These are questions for social scientists. A second step in framing the question is to break away from western or technical definitions to local definitions in order to understand local definitions and beliefs about the production and resource management systems. Development discourse has frequently proceeded using constructs that are either too static to reflect the dynamics of rural life or which do not reflect local understandings and definitions. This leads to problems when, for example, "tree" as a social construct differs considerably from the biological construct, "tree" (Bruce and Fortmann, 1987). Similarly what a professional forester defines as "worthless bush" may be considered by villagers to be a forest and an essential part of their livelihood system

(Hoskins, 1982). We need to ask what is the local definition of natural resources and how are they doing from the local point of view?--a question social scientists are particularly skilled at asking and answering.

The debate over land tenure has frequently been framed in terms of a dichotomy between private and common property. While we do not suggest abandoning these categories which clearly have heuristic value, the development of policy must recognize that rural realities are often more complex than the categories. For example, in Botswana, Roe and Fortmann (1985) found that legally (under either statutory or customary law) communal sources of water might be managed as if they were private and private sources might be used communally and that the pattern of use might shift with the season or the occurrence of drought. And legal title can be less of a concern to rural people than their security of access and use (Romm and Fortmann). (For an Indian example, see Moench, forthcoming.) That is, legal title that can not be defended is of less use than enforceable informal rights of access. Thus it is necessary to go beyond the categories to behavior.

A second crucial role of social scientists is to provide a systematic view of agricultural production and natural resource management. Rather than occurring in isolation, production and resource management and use is organized over time and space. The utility of a single resource source may depend on the availability of the same resource at other times and in other

places (fallback water points) or on the availability of complementary resources (grass and water) and upon the existence of systematically organized human activity (work groups, social control of resource use, reciprocal relationships). The systematic view of social science has given a view of natural resources that goes beyond the tree and the open well to systems of human and ecological interaction.

One example of this sort of social science contribution has been the documentation and analysis of existing systems of agricultural production and natural resource use and management which have provided (as in the case of agroforestry) models of alternatives to presently recommended practices. Social scientists such as Conklin (1975) and Ruthenberg (1980) have demonstrated the complexity and viability of such local systems. By identifying the units of social organization involved in managing these systems social science research also identifies the most appropriate points of contact for development workers. Thus, if one were introducing agroforestry to the Melaban Kantuq, one would address the longhouse apartment (Dove, 1976) whereas among the Sotho at the time Duncan (1960) did his fieldwork the consent of the chief would have been required. Social scientists have also documented household division of labor and responsibility which is useful for helping field personnel to establish contact with the right person within a household (Cf. Boserup, 1970; Staudt, 1975; Bryson, 1981; Fortmann, 1984; Fortmann, 1986). In the bad old days before social scientists,

particularly female social scientists, were listened to, rural development efforts tended to proceed on the blithe assumption that only men farmed, practiced animal husbandry, used forests or made management decisions. The results were frequently embarrassing.

A third area for social science input is the analysis of distribution, access, and security of access, issues which appeared repeatedly in our lists of causes of resource-related poverty. Security of access and control are particularly important since under what Marion Brown calls The Iron Law of Subsistence, products and resources which increase in value are likely to attract the attention of more powerful claimants, leaving the original claimant trapped in the subsistence mode. We see examples of this when husbands take over their wives' crops when they assume a commercial value, when landlords evict tenants as their production becomes valuable, and when the state permits a multi-national to exploit a resource in preference to local people. Questions to be asked on the general issue include:

What constitutes security of access for what purposes?

Which conditions of access and control facilitate resource protection and enhancement of natural resources and which encourage destructive resource use?

Who benefits and who loses under different tenurial regimes?

How can disadvantaged sectors of the population be provided with secure access to sufficient quantities and qualities of natural resources?

This last question requires particularly meticulous and serious attention as it is a key to the elimination of rural poverty and because many of the answers will involve changes in durable and fiercely defended institutions.

There is a growing tide of relevant social science work already under way such as the work on common property resource management (Panel on Common Property Resource Management, 1986) and tree tenure (Raintree, 1987; Fortmann and Bruce, forthcoming).

A fourth crucial area is the identification of groups-at-risk that are often socially invisible and who may be excluded from benefits or who may be hurt by a particular development strategy. Depending on the strategy, these groups-at-risk are likely to include women (Hoskins, 1982; Skar et al., 1982; Fortmann, 1985), ethnic minorities (Gadgil et al., n.d.), landless (Fortmann, 1985; Shiva, 1986), tenants (Fortmann, 1985; Scott, 1985), pastoralists (Delehanty and Hoskins, 1985), wage laborers (Scott, 1985), and residents of less accessible areas (Chambers, 1983). Identifying such groups and the risks they face is important to prevent adverse consequences both for the individuals and for natural resources which may be destroyed or degraded by the human sufferers either out of necessity or revenge.

Development is a process and social scientists can be uniquely helpful in, as Norman Uphoff (1986) puts it, "getting the process right." In a similar vein, A.H. Robertson (1987, p. 27) has stressed "the need for patient enquiry into the processes of economic relations⁶. This fifth area of process needs to be considered at three levels--the bureaucracy, the community, and the individual.

Development bureaucracies in general, possibly natural resource bureaucracies in particular, are frequently less effective than they might be because they have difficult and distant (sometimes hostile) relations with local people. This state of affairs has several roots--historical conflicts over policies of exclusion, official corruption and abuse, social distance, professional socialization that encourages the view that only the professionally educated know anything, and institutional demands for tangible results in a short time frame. Clearly, if progress is to be made, bureaucrats and local people must work together and learn from each other. Social science knowledge of bureaucracies has permitted the development of a new approach to this problem known as "bureaucratic reorientation" (Korten and Uphoff, 1981; see also Korten, 1981 and Johnston and Clark, 1982, ch. 5). Briefly, this approach establishes institutionalized channels of two-way communication between bureaucrats and peasants, rewards bureaucrats for listening and

adapting, and prevents them from being punished when innovations fail. The approach has had considerable success in irrigation bureaucracies in South East Asia.

While professionals and bureaucrats loom large in national capitals, in the heat, dust, and mud of villages most resource management is actually done by peasants. Social scientists are increasingly turning their attention to the conditions under which local organizations can facilitate or undertake resource management and to the question of what those institutions ought to look like.⁷ Much effort has been focused on the social organization of common-property resources. (See Panel on Common Property Resource Management (1987) generally and Ostrum (1987) in particular.) A few of the questions to be answered include-- how large can such a group be? how can the effects of government policy changes and takeover attempts by local or outside elites be dealt with? how can group regulations be enforced? More general work on local organizations has been done by Esman and Uphoff (1984) who consider questions such as under what conditions should old organizations be adapted to new tasks or new organizations established, under what conditions are traditional or new leaders more effective, how are leaders made accountable, what is the appropriate role for outside promoters? Such work is invaluable for those who hope to undertake their work through local organizations. Fortmann (1985) has pointed out the seasonal nature of many rural social organizations, a

characteristic which is important for development workers to recognize if they are to avoid mistakes such as writing off organizations that are simply dormant in the off-season.

Finally, at the individual level of process, for some time it has been recognized that active participation by the would-be beneficiaries in development projects is more likely to result in success than top-down methods. Social scientists have been instrumental in developing both the theory and field methods for participatory development (Cohen and Uphoff, 1977; Uphoff et al., 1979; Stanley and Rick, 1982).

In contrast to those whose focus is on raising production by whatever means possible, the thrust of this body of work is that process may well be our most important product. For instance, the active involvement of rural people in designing and implementing strategies to address a specific problem develops their capability to address other problems. Even if a particular strategy fails (and the history of development is full of failures), the process of involvement will have succeeded by creating as its product an increased problem-solving capacity.

Finally, social scientists can contribute by carrying on macro-level analysis. This might involve identifying processes and characteristics of the global political economy that have local effect. It might also involve considering whether and how it might be possible as Thompson et al. (1986) suggest to tinker with resource management systems so that the quantity of power within the system is increased while its concentration is

decreased. They suggest fractionating rights--separating usufructuary rights at the local level from nationally-held title, for example. This is obviously an area for some imaginative social science attention.

Conclusions

A major conclusion to be stressed is that conservation can promote production and increased production facilitates conservation. This potential for positive interaction needs to be stressed. Clearly, investment in resource conservation contributes to more stable production systems by lessening vulnerability to climatic variations, increasing the payoff to be realized from high-yield, fertilizer-responsive crop varieties, and enhancing the sustainability of the system. Of more immediate importance, however, is the fact that conservation will only be practiced if it yields returns in the higher productivity that can result from the preservation and enhancement of natural resources. The active participation of cultivators and local communities cannot be enlisted on the basis of long-term social and ecological benefits. Hence, conservation must be promoted as a profitable means of increasing production in the short- and long-term, with the latter being especially salient for cultivators who see their children as beneficiaries of the longer term improvements.

Especially in sub-Saharan Africa, there is a critical need to identify the key ingredients of more productive and sustainable farming systems that will reduce both ecological

degradation and rural poverty. A recent book by Paul Harrison (1987) describes a number of examples of "success" in devising and introducing innovations that purportedly increase both productivity and sustainability. His review of those examples was, however, cursory. The challenge for both social scientists and agricultural scientists is to regard the sort of innovations that Harrison describes as promising hypotheses that need to be evaluated more systematically to identify the agroclimatic and socioeconomic conditions in which they are likely to be successful.

Farming systems research (FSR) offers promise as a technique for increasing the relevance of adaptive research to local farmers, provided that serious attention is given to linking FSR with on-station research and to ensuring that cost-effective techniques are used because FSR is so demanding in its requirements for trained personnel. (See Byerlee et al., 1982.) A recent report by Okali and Sumberg (1986) on the work of an ILCA team evaluating a small ruminant program and alley farming in Nigeria is an interesting example. Probably the greatest need, however, is for FSR in semi-arid regions to evaluate the profitability and feasibility of techniques to improve water and soil management such as the stone lines established on the contour in Burkina Faso to slow run-off and increase infiltration (Harrison, 1987, pp. 166-70). Tied ridges are a good example of a technique that shows promise in on-station trials, but it has had little impact on local farming systems. Peter Matlon (1987)

has stressed the importance of understanding the soil and other conditions that determine whether the technique is profitable as well as the need to develop an inexpensive ox-drawn implement to reduce the labor required to establish the tied ridges.

A more general conclusion is not to marvel at the diverse roles social scientists have to play in the preservation and enhancement of natural resources but simply to point out that it is not the role of social scientists to serve as the handmaidens of technical experts but to set the agenda for development policy and strategy. If they do not, we shall most assuredly collectively go to an ecological hell in a handbasket.

Notes

1. We do not mean to suggest that rural poverty is the only cause of natural resource degradation. Urban-biased policies and international demands on LDC agricultural and forest resources also play a major role.
2. For a particularly elegant analysis of the analytical models used by decision makers and how they can be manipulated, see Peters' (1987) study of grazing land policy in Botswana.
3. For a general discussion of the problem in forestry, see Westoby (1978).
4. We recognize both the gains that have been made with single crop research and the difficulties of undertaking research on multiple components of a system or even in attempting to develop an improved crop variety when plant breeders are called upon to maximize a number of attributes, e.g. yield potential, drought resistance, protein quality, storage life, etc (see Lipton and Longhurst, forthcoming, ch.7.) Nonetheless, as evidence from our own Dust Bowl has shown, the ecological dangers of monoculture and the ecological advantages of diversified production systems are also significant. Despite its difficulties, the necessity for research on systems of agricultural production and resource management is clear, perhaps especially for many of the difficult and diverse agricultural environments in sub-Saharan Africa.
5. Exclusionary practices are often associated with colonialism, but they were utilized by European foresters and gamekeepers against their own compatriots long before the development of colonies and have continued up to more recent times (Cox, 1905; Linebaugh, 1976; Hopkins, 1985).
6. This book by Robertson (1987) presents a valuable theoretical and empirical analysis of various forms of sharecropping in Africa, stressing the dynamism of sharecrop contracts.
7. Johnston and Clark (1982, Chapter 5) note that the investment of scarce time and effort into an organization must be justified by sufficient rewards beyond those that could be realized without the organization. In some cases benefits may accrue more efficiently through the market.

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PROGRESS AND ADVANCES NEEDED IN
SOCIAL INDICATOR RESEARCH OF POTENTIAL
VALUE IN RESEARCHING RURAL ISSUES AND PROBLEMS

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The social indicators movement in the United States was initiated with great enthusiasm in the mid-1960s. Attempts to specify concrete indicators, and to interpret and justify them, during the 1970s ran into formidable difficulties and the earlier enthusiasm waned. However, some useful lines of work were identified and are being pursued at a deliberate pace in the 1980s. Carley provides an excellent discussion of the issues of policy and theory in social indicators research as of 1981. The journal Social Indicators Research, established in 1974, reflects an increasing level of sophistication in this field over time.

The founders of the social indicators movement drafted a bill entitled "The Full Opportunity and Social Accounting Act of 1967" which would have established a Council of Social Advisers (CSA) and mandated an annual Social Report of the President to Congress. The parallel with the Council of Economic Advisers and its annual Economic Report of the President was deliberate.

Two of the founders, Philip Hauser and Bertram Gross, had held responsible positions in the U.S. Bureau of the Census and the Council of Economic Advisers respectively. Evidently they hoped that the CSA would spearhead a rapid but orderly expansion of social data systems logically required to guide and monitor the "Great Society" programs enacted in the mid-1960s. Presumably the regular statistical agencies of government would have managed the expansion according to their usual high standards, with advice from top social scientists and statisticians in the universities.

The bill was not enacted, no Council of Social Advisers was created, and work done in the name of "social indicators" in the late 1960s and early 1970s was badly fragmented, eclectic, and atheoretical. It had little connection with the basic social science disciplines.

Social Systems Accounting

Where accounting frameworks are logically possible, their use permits improvements in clarity and rigor over the levels attained, or attainable, with sets of social indicators alone. A set of accounts in the narrow sense is like a jig saw puzzle for which we know the exact lengths of the four sides and also that the pieces, if properly arranged, will exactly cover the enclosed area and form a coherent picture. If all the boundary pieces were withheld and half of the interior pieces were discarded at random, we might put together "indicators" of a house, a tree, a cloud, and a patch of blue sky. But their outlines would

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be incomplete, their relative positions somewhat uncertain, and the area of the picture as a whole unknown.

Gross (1966) subsumed social indicators under the broader heading of social systems accounting. He warned (p. 271) that "progress in the collection of social indicators will be slow and uneven" and that "the maturation of social accounting concepts will take many decades. . . . It requires the participation of social scientists from many disciplines and the breaking down of many language barriers among them." He viewed social accounting as a vast scientific enterprise.

Two decades have passed since Gross wrote. The SSAAP will, hopefully, influence the level, scope, and organization of rural social science research for a similar period. Most social indicators research has focused on national data systems and on methodological experiments; little of it has dealt specifically with rural situations and issues. Rural social scientists have themselves done good work within the existing traditions.

I will devote the rest of this paper to an approach more in keeping with Gross's view of the scope and time frame required for social systems accounting. I will propose a new framework for organizing data and developing indicators relevant to the well-being of rural people. It draws on long-established research traditions in rural sociology and home economics and on the expertise of several other disciplines. Prominent among the latter are ecological psychology and eco-behavioral science, fields developed since 1947 by Roger G. Barker and his associates. While the framework might eventually be applied to urban and national populations, the initial advantages lie with rural social scientists and applications to nonmetropolitan areas. In reacting to this proposal, participants in the Phase II Workshop may at least be helped in clarifying their priorities among existing lines of social indicator research relevant to rural areas and people.

Comments on Progress in Social Indicator Research Since 1966

Space does not permit a significant review of the literature. Carley reviews all facets of the field up to 1981 and lists 250 references. I will comment on only a few items.

From 1970 on, the governments of several countries have been publishing collections of descriptive statistics under such titles as Social Trends (United Kingdom) or Social Indicators (United States). Social Indicators has emphasized multicolored charts with supporting tables and references and very little explanatory text.

Social Indicators III (1980) contained chapters on population and the family; health and nutrition; housing and the environment; transportation; public safety; education and training; work; social security and welfare; income and productivity; social participation; and culture, leisure, and the use of time. It is an example of social reporting--a selection and arrangement of existing data for informational and educational purposes. These are useful functions but they do not involve original research. Ganey et al. is an example of a social report for a single Iowa county; I assume equivalent social reports have been developed by rural social scientists in other states.

Richard Stone has for many years advocated social accounting matrices for organizing basic data into more useful forms which would also increase their accuracy, consistency, and reliability. Stone was mainly responsible for the United Nations publication, Towards a System of Social and Demographic Statistics. Page 21 presents a diagram outlining Stone's system; it contains nineteen boxes or components. Eight of these are classified as national accounts statistics: (1) production accounts, (2) leisure services accounts, (3) social security and welfare services accounts, (4) housing capital accounts, (5) educational services accounts, (6) employment services accounts, (7) health services accounts, and (8) public order and safety accounts. Nine other components (boxes) are described as sociodemographic statistics: (9) population size and composition, (10) social class, stratification, and mobility, (11) leisure, (12) housing conditions, (13) families and households, (14) learning activities, (15) earning activities and the inactive, (16) health, and (17) delinquency. A third category, distribution accounts statistics, contains a single box, (18) distribution accounts, and the last category, time accounts statistics, also contains one box, (19) time accounts.

Some components are connected with others by solid lines, indicating that the data in the two or more boxes are "integrated"; broken lines between boxes indicate "that they are more loosely connected." The core of the system seems to be (9), population size and composition, and ten other boxes are linked with it directly or indirectly by solid lines. Stone recognizes the possibility of linking several of these components into a more formal model, but he emphasizes that "the urgent need in most countries is to see as clearly as possible the next few steps ahead" (p. 22).

Land has played a leading role in the development of social indicator models, analogous to causal ordering models in the econometric tradition and to Tinbergen's economic policy models. Andrews has led in the development of subjective indicators based on individuals' perceptions of the quality of various aspects of their lives and their global levels of well-being.

The OECD List of Social Indicators (1982) will be highly influential during at least the next few years. It reflects discussions, beginning in 1970, among representatives of OECD's 24 member countries, including the United States. The list includes 33 specific indicators grouped under eight social concerns: health, education and learning, employment and quality of working life, time and leisure, command over goods and services, physical environment, social environment, and personal safety.

The indicators are designed to measure trends in individual well-being. In most cases they are social outcomes or outputs.

Carley (p. 2) says that social indicators are surrogates or proxies for unmeasurable social concepts. For example, the social concern "Health" in the OECD list is represented by four indicators: life expectancy, perinatal mortality rate, short-term disability, and long-term disability. If life expectancy increases, we say "Health" has improved; we say the same if one or more of the other three indicators decrease.

Social Indicators and Social Theory: Elements of an Operational System

This section heading is the title of a book I wrote in 1973 and published in 1974. It had a strong accounting emphasis and should perhaps have been labeled

"social accounts and social theory", but social indicators was the generic name of the field and the one that would reach my intended readership.

Glenn Johnson (pp. 139-148) has described my research leading up to it and I have described it myself in Fox (1986). I had admired efforts by Boulding, Simon and others to promote a closer integration of the social sciences and my service on the board of directors of the Social Science Research Council (1963-67) had encouraged me to extend my own reach. Gross's scenario for the development of social indicators and social systems accounting seemed ambitious in the extreme, but something like it would be necessary to bring some coherence into the badly fragmented, atheoretical, and highly eclectic field of social indicators. When I suddenly found myself with fourteen months of freedom for concentrated research I tried to make a major contribution.

In the preface, I expressed the hope "that this book will facilitate convergence toward an operational system or systems of social accounts and indicators.

What is called for, I believe, is an integration of theory, methods, and data across the 'social' parts of the social and behavioral sciences . . ." (p. vii).

I did not claim to have accomplished anything of this magnitude. I did say that I had tried to read quite widely in the social sciences and to achieve a fairly uniform understanding of them at the level of the International Encyclopedia of the Social Sciences. "In this book I have tried to juxtapose concepts from several disciplines in a rough and preliminary fashion: time budgets, behavior settings, generalized media of social exchange, total income, transactional analysis, life cycle stages, social readjustment rating scales, functional economic areas, occupational structures, and others . . ." (p. x).

My chapter headings included social science concepts relevant to a system of social accounts; derivation and implications of a scalar measure of total income (written jointly with Paul van Moeseke); some other attempts to combine economic and noneconomic variables in theoretical models; time budgets, behavior settings, and total income; individuals and families; national goals accounting and policy models; social indicators and models for cities and regions; accounts and indicators for the higher education sector; occupations and earnings; elements of an operational system: I. individuals, families, and organizations in a small community, II. cities and regions, and III. national and world models and data; and social indicators and social theory. The text referred to 250 publications and the appendix (some comments on related literatures) to 250 more.

Carley kindly described my book as "perhaps the most comprehensive attempt at a theoretically based system of social indicators to date" (i.e., 1981). . . (p. 63).

"(The Fox-van Moeseke) total income model has a definite notion of welfare, is structured theoretically, and puts forward an accounting framework for selecting and operationalizing indicators which relate to the social model of the concept (It) has considerable value as a paradigm for relating social indicator research to the social sciences generally. It is, in short, a necessary innovation in social indicator research . . ." (p. 64).

Roger Barker's concept of "behavior settings" proved central to my approach. My author index included 41 page-references to Barker compared with 24 for the social scientist next in line.

Behavior Settings as Basic Units in a System of Social Accounts

Roger Barker originated the concept of behavior settings nearly 40 years ago. Trained as an experimental psychologist, he had done distinguished research (some of it jointly with Kurt Lewin) in the field of child development. In 1947 he obtained funding for a long-term study of children's behavior in the settings of everyday life.

Barker established his Midwest Psychological Field Station in a small county seat town in northeastern Kansas which he code-named Midwest. It was several miles distant from any other town, and Barker found that Midwest's children under 12 spent 98 percent of their time within the town limits. Detailed studies of individual children showed that most of the variation in their behavior was accounted for by transitions between settings such as school classes, playgrounds, streets and sidewalks, home family meals, Sunday worship services, and the like. Children's behavior depended much more on where they were than on who they were. Each setting had a different "program" which imposed a different pattern of expectations on the children and elicited a distinctive pattern of behavior from them.

The same was true of adults as they moved from banks to grocery stores to bowling alleys or to business meetings. Their behavior was structured by these behavior settings. Collectively, Midwest's behavior settings constituted the environment of its residents' behavior. Barker's insight was later expressed as follows by Gump (p. 134): "People live out their lives in a sequence of environmental units; experience in these settings is life. If the quality of experience is good, life expands; if it is bad, life diminishes."

Behavior Setting Surveys

Behavior settings are the basic units of organizations and communities. From the perspective of an experimental psychologist, a behavior setting is a marvellously complex entity. It imposes expectations and demands on each of its occupants according to his role in its program; minor deviations from the role-norm are countered almost instantly by pressures from other occupants and major ones lead to his ejection from the setting. Circumstances may confine a child to a few settings; if his behavior is appropriate to them it is not likely to change unless he "migrates" on a full-time or part-time basis to other settings which impose different demands. An adult confined to an institution or restricted by poverty or physical disability to a few settings will adapt his behavior to them; he may not be deprived of food, clothing, and shelter but he is deprived of a normal range of opportunities for social participation--he subsists but he does not belong to the mainstream of his society. An adult in the mainstream will choose to participate in a wider array of behavior settings which collectively define one of the normal, desirable, or acceptable life styles of his time and place.

In 1951-52, Barker conducted the first of a series of year-long behavior setting surveys. He made detailed observations of the 585 community behavior settings which existed or occurred during the year (stores, school classes and the like) and, along with many other data items, included estimates of the amount of time spent in each by town residents. He did not survey family behavior settings but he noted (Barker and Wright, p. 84) that the common varieties were home meals, home indoors, home outdoors, home bathrooms, and home festive occasions.

Barker was clearly aware that his methods could be extended to yield complete time budgets, for on pages 97-98 he said: "During the survey year we estimate that Midwesterners spent 5,130,000 hours in family settings, 1,030,658 hours in community settings, and 330,620 hours in foreign settings" (i.e., settings outside the limits of the town). His Figure 4.2 on page 98 shows the average hours per day spent in the three classes by each of seven age groups, the two sexes, and three socioeconomic classes.

Importance of Trade Area Residents. In his 1963-64 survey, Barker (1968) included estimates of the time spent in each of Midwest's 884 community behavior settings by the town's residents and also by nonresidents, as summarized in Table 1. Nonresidents accounted for 52 percent of the occupancy time in school and church settings and 47 percent of that in settings sponsored by voluntary associations (lodges, clubs, youth organizations, and many others). Evidently the attendance and membership areas for Midwest's schools, churches, and voluntary associations approximately coincided with each other and with the trade area. As customers and clients, residents and nonresidents must have been equally important, though most of the business and professional people no doubt lived in town.

Some 45 percent of the total occupancy time by nonresidents was in school-related settings. If Midwest lost its high school, over 20 percent of the total nonresident occupancy time would be diverted to another location; if it also lost its elementary school, another 20 or 25 percent would be diverted.

Importance of Active Roles in Nonmarket Settings. Barker also estimated the number of different persons who entered each behavior setting at least once during the survey year. The total number of these inhabitant-setting intersections (ISIs) was 130,080. Of these, 14,249 involved responsible roles as leaders or assistants in carrying out setting programs. Some 86 percent of these responsible roles occurred in settings sponsored by the schools, churches, and voluntary associations. They provided a great many opportunities for children, adolescents, and retired people to participate in the leadership and implementation of behavior settings approved by the community. A minute percentage of these roles was performed by paid professionals (teachers, coaches, ministers) and the rest by amateurs.

Mutual Selectivity of Settings and People. The 830 town residents accounted for 50,809 ISIs, an average of 61.2 per person. This implies a high degree of selectivity of people for behavior settings and vice versa, for 61 settings amount to only 6.9 percent of the 884 settings available. Many school, church, and voluntary association settings were age-graded and some were wholly or partly differentiated by sex. Some residents patronized only one of the four service stations or three grocery stores, entered one or none of the four attorneys' offices, or abstained from all church-related activities. Some settings (e.g., the American Legion Memorial Day service) existed for only a fraction of one day during the entire year.

Settings and Genotypes versus Establishments and Industries. Barker classified settings with identical programs into categories which he called genotypes. Thus, Midwest's four service stations all belonged to Genotype 177 (Service Stations). In this case, Barker's treatment was identical with the classification of establishments into industries in the Standard Industrial Classification (SIC) system; this was true of many other private enterprises in Midwest which consisted of single behavior settings.

Table 1. Occupancy Time by Class of Authority Systems

Class of authority systems	Number of settings	Occupancy time: person-hours		Percent by town residents
		Total	By town residents	By non- residents
Private enterprise	132	734,183	531,555	202,628
Government	114	308,075	186,896	121,179
School	233	650,124	310,516	339,608
Church	193	69,753	33,173	36,580
Voluntary association	212	118,595	62,994	55,601
Total	884	1,880,730	1,125,134	755,596

Source: Compiled and reconstructed from various tables in Roger G. Barker and Phil Schoggen, Qualities of Community Life, San Francisco: Jossey-Bass, 1973.

However, a manufacturing establishment with fewer than 15 workers consisted of one setting from Genotype 64 (Factory Assembly Shops) and one from Genotype 38 (Commercial Company Offices): the SIC system would place the whole establishment in a single industry. Midwest High School included settings from as many as 30 genotypes: the skills of teachers in the different academic and vocational subjects were not interchangeable; neither were those of coaches and players in the different athletic sports or of directors and performers of plays, choruses, or various kinds of instrumental music. The SIC system would classify Midwest High as a single establishment in a single industry.

Genotype Programs and Occupational Classifications. Barker's succinct description of each genotype's program identified the occupation of each type of gainfully employed participant (e.g., service station manager, service station assistant). These occupations are listed in the Standard Occupational Classification (SOC) and the Dictionary of Occupational Titles (DOT). Three numbers in each code identify the usual complexity of workers' functions in that occupation in relation to data (information of all kinds), to people, and to things. The Handbook for Analyzing Jobs (HAJ) contains information about levels of general educational development and specific vocational preparation required for typical jobs in the occupation along with various relevant aptitudes.

Social Change and Cultural Differences. Barker and Schoggen described social change in Midwest from 1954-55 to 1963-64 partly in terms of the disappearance (erosion) of some genotypes and the introduction (accretion) of others. In each of those years they made similar surveys of an English town (code-named Yoredale) showing cultural differences partly in terms of the presence or absence of specified genotypes.

Trade Center (Central Place) Hierarchies Defined by Arrays of Genotypes. The array of private enterprise genotypes in Midwest as of 1963-64 permits us to classify it as a full convenience center in a trade center hierarchy defined by Borchert and Adams. Midwest had two or more establishments (behavior settings) in six of the nine genotypes required for a minimum convenience center. It had only one establishment (behavior setting) each in eight of the nine additional genotypes required for full convenience status, indicating that Midwest and its trade area exceeded the threshold population size and buying power for this status by a rather small margin. Midwest had none of the 13 "specialty" retail business functions (genotypes) listed by Borchert and Adams, any 4 to 8 of which would define a partial shopping center and any 9 or more of which would define a complete shopping center.

Action Patterns and Social Concerns: The Goals of Behavior Settings. Barker rates eleven action patterns in each behavior setting on scales ranging from 0 to 9. Action patterns are goal-directed or output-oriented. Midwest's bank was rated 9 on business, 7 on professionalism, 4 on social contact, and zero on several others. The setting High School Boys Basketball Game was rated 8 on recreation, 6 on social contact, and 0 to 2 on the others. The setting District Court Sessions was rated 8 on government, 7 on social contact, and 5 on professionalism. Average ratings for settings in the genotype Religious Prayer and Meditation Services were 8.8 on religion and 5.2 on social contact. Most high school academic classes were rated 7 on education. Barber and beauty shops rated high on personal appearance, restaurants on nutrition, dentists' offices on physical health, church weddings and funerals on aesthetics. Space does not permit a description of Barker's careful definitions and measurement procedures.

Barker's action patterns correspond to social concerns and cultural values. They are the microsocial equivalents of categories used in the OECD list of social indicators and various social reports.

Behavior Mechanisms and Relationships to Data, People, and Things. Each setting is also rated from 0 to 9 on five behavior mechanisms. The setting High School Boys Basketball Game was rated 9 on affective (i.e., emotional) behavior, 7 on gross motor activity, 7 on use of the hands, 9 on talking (including yelling), and 4 on thinking. These ratings apply to the setting as a whole; the players separately would no doubt rate 9 on gross motor activity and the spectators much less than 7.

The factory assembly shop rates 9 each on gross motor activity and use of the hands, while the commercial company office in the same establishment rates 1 and 5 respectively. One of the most subdued behavior settings is the self-service laundry, which rates 3 on talking, 2 on use of the hands, 1 each on affective behavior and gross motor activity, and 0 on thinking! (Presumably the setting program requires decision-making for only a minute or two per hour, and that at low levels of speed and intensity).

Behavior mechanisms have only an instrumental relationship to the action patterns, goals, or outputs of a setting. But the behavior mechanisms used by paid workers have important implications. Thinking implies relationships to data; talking and affective behavior imply relationships to people; and use of the hands implies relationships to things. The complexity levels of these relationships are used to classify occupations in official data systems. Gross motor activity is closely related to strength required or heaviness of work which also figures prominently in the matching of workers to jobs.

Behavior Settings and Physical Capital: The Built Environment. Finally (for present purposes), behavior settings require physical capital in the forms of enclosing structures and various kinds of furnishings and equipment. The equivalent of four years of the nation's gross economic product (GNP) is embedded in the buildings and equipment in which and with which we live and work. The houses last an average of perhaps 70 years, various other structures 30 to 50, and various types of equipment and consumer durables perhaps 8 to 15.

In the short run, physical capital enforces stability and continuity in most of the activities of daily life; in the long run it enforces change. The immediate physical environment of our behavior changes in size, shape and technology and in its distribution over space; we must go with it, for it contains us. As for social and cultural change, we must recognize that people not only behave in behavior settings--they learn to behave in them.

Behavior Settings, Ecological Psychology, and Eco-Behavioral Science

In 1947 Barker intended to study the everyday behavior of children in their "natural" habitats in the town of Midwest. He thought of this as ecological psychology, as opposed to experimental and clinical psychology, and to this day Barker and his former colleagues and students are known as "ecological psychologists."

However, by 1969 Barker (Barker and Associates, pp. 1-2) realized that his research on behavior settings, organizations, and communities as environments of human behavior had led him into a new discipline independent of psychology which

he called eco-behavioral science. It took me a long time to work out the approximate relationships of Barker's concepts and measures to those of the various official data systems mentioned in the preceding section. My results are presented in my 1985 book, Social System Accounts: Linking Social and Economic Indicators through Tangible Behavior Settings. I believe social scientists from many fields will find it readily accessible.

Alternative Views as to the Scope and Nature of Eco-Behavioral Science.

Wherever social sciences and applied fields must come to terms with the physical, visible, tangible environments of human behavior, the concept of behavior settings and the method of behavior setting surveys appear to be useful. Is it possible, then, that eco-behavioral science is simply 'a science of intersections' to be applied on an ad hoc basis when the periphery of an established discipline happens to intrude upon the environment? Or, is it an 'envelope science' which surrounds portions of several disciplines and deals with phenomena which are always present at the interface of behavior and environment but can usually be ignored because the disciplines operate at safe distances from that interface? Or, finally, is it a 'comprehensive science' which includes observable variables of interest to several disciplines in its standing behavior patterns, programs, and differential habitats in such a way that the phenomena proper to each discipline can be reproduced by suppressing those variables which the particular discipline ignores?

Whichever view we take, the fact remains that eco-behavioral science has not yet received the concerted and cumulative attention of scientists from all the disciplines to which it may be relevant. I have tried to point out some of the interdisciplinary relationships and needs for development in Fox (1984).

The first view invites individual research and extension workers to experiment with behavior setting concepts as ad hoc supplements to their present approaches. The second suggests cooperation among workers from two or more disciplines to see if their separate views of a rural community or organization can be usefully integrated within a behavior setting and time budget framework. The third is not operational in the near or perhaps even the distant future and can be left as "something to think about."

Social Accounts and Indicators in a Hypothetical Self-Contained Community

Suppose for a moment that Midwest and its trade area were a self-contained community--that no one entered or left it for a period of years. In the first year, each person would have to allocate his/her time exhaustively among the existing array of behavior settings.

To increase the well-being of community residents according to the standards of (say) U.S. society, it would be necessary to improve the quality of their experience in its behavior settings. Some improvements might be accomplished by changes in the physical aspects of the community (structures, equipment, public utilities, and so on). Other improvements might come through changes in the capacities and value-orientations of individual residents (physical, mental, and emotional health; work-related and other skills; value commitments and character). Still other improvements might be realized through changes in social organization, information flows, decision processes, and leadership within and between behavior settings.

In a self-contained community, these improvements in physical and human capital would have to be produced in existing behavior settings or in new ones created for such purposes. For example, the activities of some settings concerned with education, training, and health maintenance would have to be expanded and/or made more efficient. If the desired improvements were accomplished, they should be observable and measurable in the behavior settings of the community in subsequent years; the increased capacities of individuals should be reflected in their performances in behavior settings.

The Fox-van Moeseke model portrayed an individual as seeking to maximize his perceived well-being, $u(x)$, during the coming year by allocating his time, x , among the n behavior settings in his community subject to limitations on his $m-1$ different kinds of behavioral capacities and on his money income from property and transfer payments, y . On certain assumptions, he is able to choose an optimal allocation of his time, x^* , among the behavior settings; the vector x^* represents his life style. The vector b , with m elements, is his endowment. Since the m th element, namely y , is measured in dollars, it is theoretically possible to attribute a dollar value to each of the $m-1$ behavioral capacities; the sum of these $m-1$ dollar values is his social income, S.I., and the sum of S.I. and y is his total income. The behavior settings he occupies are his actual environment; the entire n behavior settings of the community are his potential environment.

In general, an increase in any of his behavioral capacities would yield an increase in his total income and some change in his allocation of time; so would a decrease in the proportions of any of his capacities required per unit of time spent in relevant behavior settings.

Regardless of how time allocations were explained, each resident in a closed community would in fact allocate his/her time among its behavior settings. Visualize a large two-way table or matrix with a column for each behavior setting and a row for each resident. We may call the matrix as a whole a time-allocation matrix (TAM) and any row of the matrix a time-allocation vector (TAV). If residents were classified by age, sex, and socioeconomic status, the vectors for all members of a given category would be aggregated to form a time-allocation vector for the category; on a per-member basis it would represent the average life style of the group. The columns representing behavior settings with identical programs could be aggregated to the genotype level.

The action pattern ratings for each genotype represent its apparent contributions to individual well-being in the community. These ratings can be related at least qualitatively to the eight social concerns and 33 social indicators in the OECD list.

Genotypes Available in Town-and-Trade-Area Communities
of Different Populations in a Nonmetropolitan Area
and Their Adequacy as Viewed by Different Residents

The residents of any actual town the size of Midwest make some use of genotypes found only in larger places. Barker found 198 genotypes in Midwest in 1963-64. In informal correspondence, Schoggen conjectured that there might be around 400 genotypes in the largest cities. My own conjecture is that there are no more than 300 in nonmetropolitan commuting fields with central cities of less than 50,000 people.

A catalog of additional genotypes and their programs in towns and small cities of successively larger sizes (up to 50,000) in agricultural regions would be useful in diagnosing the adequacy of the arrays of genotypes accessible to residents of different ages and degrees of mobility. A time-allocation matrix containing estimates of the amounts of time spent by each category of residents of a town-and-trade-area (1) in specific genotypes within the local area and (2) in specific genotypes outside the local area would give a clearer idea of deficiencies in the local environment and of realistic ways to remedy some of them. A time-allocation matrix for residents of the central city (of 30,000 to 50,000 people) would provide estimates of the largest arrays of genotypes actually used by age and other groups with the fewest spatial limitations on access.

Quantitative information of this sort should facilitate the discovery and validation of opportunities to improve the spatial allocation of behavioral resources (settings and genotypes) and provide shared access to existing facilities by people in different local political jurisdictions.

The Advantages of Rural Social Scientists in Social Accounting and Social Indicators Research

Rural sociologists have been surveying small communities for over 70 years. Galpin published a brilliant application of central place theory in 1915, nearly two decades before the theory was officially originated by Christaller. From 1915 on, a rural community was defined as a town and its trade area.

The population of the town-and-trade-area community was small enough to permit a sociologist to talk with virtually all community leaders, to enter and observe most of the community's open-to-the-public settings, and to talk with many individuals about aspects of family life, visiting patterns, social stratification, and attitudes. From this perspective, Barker was simply doing a special kind of community survey. Barker and Wright (p. 3) knew they were engaged in cross-disciplinary colonization, but the fact that this approach sometimes led to major scientific breakthroughs emboldened them "to enter the territory of the sociologist and the anthropologist without a passport, or a guide, or even a guide-book."

I have read very little of the home economics literature, but I am confident that home economists have been making detailed observations of household behavior settings (under other names) for several decades. The concepts of complete time budgets for individuals and of time-allocation matrices for communities provide a framework for pilot attempts to synthesize the results of surveys already made independently by (a) rural sociologists and (b) home economists. Central place theory and common observation indicate that many towns of similar population size in a given region will have similar arrays of business establishments, schools, churches, voluntary associations, and local government functions. County seat towns will also have similar arrays of state and federal government offices. The distributions of household types and sizes in different communities can be compared from census data. To get started, results from a household survey made in one community could be used to fill in some columns of a time-allocation matrix, while results of a survey of businesses and institutions made in another community could be used to fill in the rest.

The process of synthesis of existing knowledge could also begin at the level of individual settings. Some extension and experiment station economists have detailed knowledge of the staffing patterns and layouts of most types of retail trade, service, and agribusiness establishments found in rural communities in

their states. Related expertise may be found in business schools, schools of architecture, departments of industrial and civil engineering, and schools of education on the same campuses. Typical staffing patterns, curricula, and physical layouts could be determined for elementary schools, high schools, and churches of the sizes common in rural areas. Similar information could be assembled about common types of dwelling units and approximate allocations of time-at-home by household members.

It would be possible to assemble a data base of typical behavior settings from each of the genotypes commonly found in rural communities. The data base would also include an array of time-allocation vectors.

With such a data base, it would be possible to synthesize time-allocation matrices embodying many constraints implied in census and administrative data for particular communities. In working with leaders in a given community, the synthesized matrix could be used as a basis for eliciting their judgments as to how far various rows and columns depart from current reality. Current data on school enrollments and on the loss or accretion of genotypes since the last censuses could be used to revise, delete, or add specified columns. Obviously, the nature of the problems of direct concern to community leaders would determine how much time and effort was justified in revising the "prefabricated" matrix.

The interpenetration of urban and rural populations has been noted by both rural and general sociologists for several decades. Douglass published an insightful book on The Little Town in 1919 and an equally insightful one on The Suburban Trend in 1925. McKenzie published a series of papers on human ecology in the 1920s and a classic work on The Metropolitan Community in 1933. Rural sociologists matter-of-factly noted the effects of automobiles, telephones, and radios on farm and town life as they became available.

The automobile in particular opened up many rural communities which had been nearly self-contained in terms of their social interactions and therefore easy to study. During the 1960s I wrote many papers about functional economic areas (e.g., Fox and Kumar), which I delineated as home-to-work commuting fields centered on cities of (usually) 30,000 or larger and located (usually) at distances of 30 miles or more from the nearest city of the same or larger size. Average speeds of automobile travel have not increased much since the 1960s, so I believe that the boundaries of most commuting fields in agricultural regions have been fairly stable. A commuting field by definition includes the workplaces of nearly all of its residents.

Disciplinary scientists in urban universities seldom concern themselves with (or know much about) nonmetropolitan areas--i.e., areas with central cities of less than 50,000 population. Using central place principles and the possibilities of direct observation of samples of behavior settings, rural social scientists should be able to develop time-allocation matrices and indicators for functional economic areas (FEAs) containing as many as 250,000 people. BEA Economic Areas usually contain two or more FEAs. If justified by the needs of state governments and of nonmetropolitan residents, rural social scientists and campus colleagues could probably extend the same approach to BEA Economic Areas including as many as 2,000,000 people without losing touch with micro-level realities.

One caveat is in order. The number of scientists who are thoroughly familiar with Barker's method of behavior setting surveys is quite small; so is the number of economists who thoroughly understand the relationships of behavior settings to official socioeconomic and demographic data systems. Behavior setting

surveys and time-allocation matrices for communities much larger than Midwest's town and trade area (about 1600 people) will require sophisticated sampling techniques and innovative uses of secondary data sources. Some intensive workshops will be needed to transfer Barker's technology to interested rural social scientists and to adapt it to their needs.

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CONTRIBUTIONS OF SOCIAL SCIENCES TO AUGMENTATION
OF HUMAN CAPITAL FOR GENERAL ECONOMIC GROWTH

By Wallace E. Huffman^{*}

The concept of human capital and models of agricultural households are central to understanding the differences in behavior of agricultural households in countries at very different levels of development. Although the perspective presented here will build primarily upon economics, other social sciences, especially sociology, provide an additional perspective on many of the same issues. Anyone involved in economic planning, development, or evaluation may find it fruitful to view the characteristics of people even more broadly and focus on what is frequently labeled human resources.

The share of households (or families) that engage in agricultural production has a wide range across countries in the world--in excess of 70 percent in developing countries to near 5 percent in developed countries. Furthermore, we observe agricultural households at many levels of development. They have very different structures (e.g., ranging from large extended to small nuclear families), function under a wide range of cultures and social norms, and make many decisions about resource allocation, schooling, migration, health, etc. The agricultural household model and human capital theory provide a powerful conceptual framework for viewing the sources of economic growth and for explaining behavior in a consistent manner.

The objective of this paper is to provide a social science perspective on the augmentation of human capital for increases in productivity and welfare and for understanding the resulting changes in behavior of individuals and rural households. The plan is to first review a framework of analysis that includes both human capital and agricultural household models. Second, some implications for a growth environment are developed. These concentrate on (i) changes in the role of the family and how this is associated with changes in the structure of the family and agricultural labor and land markets, (ii) skills for adjusting to the world economy, (iii) the life-span revolution and its effects on general welfare and on other human capital investments, and (iv) advancing agricultural science and technology and its useful application in agriculture. Third, some priorities are suggested.

Background

The concept of human capital and models of agricultural households are central to understanding the behavior of agricultural households functioning in very different economic and technical environments.

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Although the concept of human capital can be traced back more than 200 years to Adam Smith's Wealth of Nations, the modern emphasis on the role of human capital in economic growth is traced to Schultz (1960, 1961a) and Denison (1962, 1967). They showed with the aid of a simple framework that education contributes directly to growth of national income by improving the skill and productive capacities of the labor force. These early studies focused largely on the effects of education and labor market experience on income of wage earners of farmers. Other aspects of human capital--like human migration and information on the job market--were also viewed primarily from the perspective of their effects on household income.

Schultz (1966), however, saw the role of human capital more broadly in his early article. Capital is anything produced at a cost and expected to yield valuable services over future periods. When it is embodied in human beings, it is called human capital. Also, Becker's (1965) article on the allocation of time in a productive household sets the stage for analyzing the production of and effects of a much broader range of human capital types than education. The decade of the 1970s saw an explosion in the volume of literature dealing with the production of and effects of a broad set of human capital types. Regarding the effects of human capital in developing countries, a significant part of this research is summarized in Jamison and Lau (1982) and Singh, Squire, and Strauss (1986).

The share of households (or families) who engage in agricultural production has a wide range across countries in the world--in excess of 70 percent in developing countries to about 5 percent in developed countries. The agricultural household model, developed first by Jorgenson and Lau (1969), provides a consistent and flexible framework for viewing the role of human capital and for viewing households' responses to changes in public policy (see Singh, Squire, and Strauss 1986, pp. 3-14).

In these models, households--which may contain more than one family--are generally assumed to have a household utility or welfare function that translates consumption goods into satisfaction. They face a number of constraints (i) cash income, (ii) human time of members, and (iii) technology of household and farm production. They make decisions on a large number of activities: consumption, production, and labor supply. Production activities may encompass the household as well as a farm business. When household production augments the stock of good health, the human time constraint becomes endogenous, and the possibility of adopting new technology makes the technology of farm (and household) production endogenous.

The agricultural household models have been a valuable tool for shaping and interpreting empirical work. They can be adapted to farm households that are self-sufficient, semi-commercial (e.g., Singh, Squire, and Strauss 1986), and advanced commercial (e.g., Lopez 1984). They can also be extended from single to multi-period decision-making when investment decisions are being made. The models permit an analysis of effects on production, consumption, labor supply and welfare of a wide range of public policies focused upon: agricultural input and output prices, health, education, fertility (population), land distribution, immigration-migration, and insurance.

Implications From the Model

In this section, I examine four subjects that seem to be quite important for understanding household and family response to economic growth.

Changes in the Role of the Family

Although theoretical growth models (e.g., Solow 1956) ignore important institutions like families, the family plays a very important economic and social role in all societies (Becker 1981). Its size and activities are determined by social norms, the needs of individuals, and the opportunities available in the market. The family serves as an institution for bridging the interests of the young and the old together (Becker 1987).

Agricultural households in all societies face uncertain outcomes about a number of important economic events (Jensen 1986). At a minimum, agricultural production processes, especially plant, are very sensitive to weather conditions in almost all parts of the world and health status is uncertain. In advanced countries, the frequency of superior new technologies is random and labor market conditions are frequently changing.

One of the primary services that families produce or supply to their members in low income countries is insurance against uncertain outcomes. They self-insure against loss of income or welfare due to (i) adversity of weather (drought, floods, tornadoes), (ii) price and technology risk, (iii) extended illness and unemployment, (iv) marital dissolution, and (v) retirement (uncertain length of life) or allocate resources to self protection, i.e., to changing the probability of loss.

In more advanced urban, industrial countries, the government sector supplies a wide range of programs that provide insurance (i.e., unemployment and workman's compensation, social security, welfare) and the market supplies insurance and other instruments for reducing risk. Ehrlich and Becker (1972) have shown that market insurance and self-insurance are substitutes for households, i.e., as market insurance becomes available and its price declines relative to the price of self-insurance, market insurance will at least partially replace self-insurance. Human capital seems to play an important role in determining the types of insurance that are available and in efficiently using the options that are available (Becker 1987).

The family has some advantages over the government and market in supplying insurance (Pollak 1985). They arise from reducing the problems of adverse selection and moral hazard. Adverse selection arises when individuals seeking voluntary forms of insurance are significantly different from a randomly selected sample of the population, i.e., they have a larger expected loss. This arises because information about expected losses are difficult to obtain, and individuals seeking insurance know their probability of loss better than the insurer and can misrepresent the expected loss. Moral hazard arises when individuals who insure change their behavior because they are covered by insurance. They undertake activities that change the probability of expected loss or that misrepresent the magnitude of losses that occur. For example, an individual will have larger medical bills when he (she) is covered by medical insurance than when he (she) is not, holding constant the frequency and severity of illnesses.

With family supplied insurance, adverse selection is limited because outsiders cannot easily join the family nor insiders withdraw. Also, informational disparities between individuals and their families are generally smaller than those between nonfamily members, i.e., physical proximity yields substantial monitoring advantages. Moral hazard is also less serious because family loyalty and cultural norms limit opportunistic behavior (Pollak 1985). There are also some disadvantages. The primary one is that family groups are relatively small and frequently geographically and occupationally concentrated so risk cannot be efficiently pooled or spread widely.

Land-specific information, a form of human capital, is productive (valuable) in a no growth environment. Under conditions where technology is static (i.e., no growth), agricultural land is heterogeneous, weather is random, and the government and market do not supply insurance, then accumulated land-specific information is productive. Its accumulation is facilitated by an extended family type of household structure (Rosenzweig and Wolpin 1985; Rosenzweig 1988).

Information accumulated through experience in farming the land or working in the household does not depreciate when technology is unchanging. Given cultural norms and role expectations for boys and girls, the extended family faces economic incentives for boys to start working on the family farm and girls to start working in the household and for them to continue this work as they become older (Becker 1981, Ch. 2; Rosenzweig and Schultz 1982). For boys, they obtain valuable on-the-job learning of the idiosyncratic nature of the family's land. Furthermore, boys are willing on average to work for a wage that is much lower (could be zero) than the wage rate acceptable to nonfamily hired labor because of the future benefits they expect to receive from the accumulated experience on the family's farm (and because of lower transactions costs). Girls learn valuable skills associated with caring and raising children, preserving food, making clothing and handicrafts, and managing a household (Bryant 1986; Nichols 1986).

Since technology is static and nonagricultural employment unlikely, the expected return to formal schooling of boys (and girls) is low. Thus, children from farm families in a static environment are expected to complete few years of formal schooling (Rosenzweig and Evenson 1977), and the boys are expected to attend irregularly because of fluctuations in demand for farm labor due to its seasonal nature. Work experience is the valuable form of human capital in a static environment.

In (poor) societies where women have no property rights, the extended family owns all the land, technology is static, and women working in the market is socially frowned upon, boys are more likely than girls to be retained in the extended family when they become adults. The boys have on average more family (land) specific human capital than the girls. The males' extended family can take advantage of their stock of accumulated family land-specific knowledge. Furthermore, among boys, the oldest is in a unique position for obtaining the largest stock of farm specific human capital. Thus, if there are insufficient resources to employ all sons on the family farm, the younger ones will be encouraged by the family to pursue nonagricultural interests. The opportunity cost of going to school will be lower for them than for the oldest son, and the expected return from formal schooling will be

higher. Thus, younger sons will be expected in this type of environment to obtain more years of formal schooling on average than the oldest son.

Elderly males are also retained in the extended family because of kinship ties and because they are a source of useful extension information. They are the oldest males in the household, and as such they have the largest accumulated stock of farm-specific human capital dealing with the family's heterogenous land (Rosenzweig and Wolpin 1985).

In a static environment, the family can be expected to be the primary source of insurance, and the insurance role is best served by having a relatively large number of low quality children (i.e., little schooling) that are relatively evenly spaced over the fertile years of the wife and an extended family. This is so that the extended family has an even supply of labor over time and that the parents have a diverse portfolio of earning streams in old age.

Although in a static technical environment with heterogenous land, boys are more likely to be retained in the extended family than girls when they become adults, agricultural families may be quite concerned with the choice of a husband for their daughters. First, when a woman's parental family bear most of the cost from marital dissolution by taking her back into their family, the expected cost to her family will be reduced if her parents (and grandparents) (help) make the spouse selection. Second, the geographical location of their daughters is likely to be important to parents. Costs of visiting and communicating will increase as distance between daughter's and parent's home increases. However, if the daughter's family is part of the family insurance pool, e.g., by extending credit in hard times, the daughters should be strategically placed so as to provide a good risk pool.

The correlation of random weather conditions for different geographical locations decreases on average as the distance between parent's and daughter's families increases. Thus, net agricultural income risk associated with random weather conditions will on average decline as daughters marry husbands who live further from their parents' farm (or village) and from each other. Thus, there should be some optimal distance that married daughters should be located from their parents in order to reduce income risk associated with random weather and costs of getting families together (Rosenzweig 1988).

The husband's family also has an incentive to be involved in the spouse selection process. This occurs because if the marriage is to be successful, the woman--an outsider--must be accepted and become an integral part of her husband's extended family--similar intensity of religious beliefs, importance of children, and similar preferences for consumption of market goods.

When technology is dynamic or a steady stream of new technologies are becoming available, formal schooling has an advantage over on-the-job experience. For agriculture, much of the new agricultural technologies are geoclimatic or land-specific, and changing technology causes rapid depreciation in land-specific human capital. Being able to make abstract decisions on the goodness or badness of agricultural technology

is now valuable. Thus, dynamic agricultural technologies reduce the expected pay-off to farm-specific human capital (i.e., reduces the opportunity cost of schooling of male youth), reduces the differential between wages acceptable to nonfamily hired labor and family labor (i.e., makes hired labor economically more attractive), increases the expected return to formal schooling, and reduces the productivity of the elderly. Schooling levels of farm youth will rise on average even when they expect to work a life-time in agriculture (Rosenzweig and Evenson 1977).

When the technology of household production is changing (Bryant 1986), the future value of on-the-job training in the household is also reduced. Formal schooling of girls now becomes relatively more attractive from the family's perspective. One reason is the reduced long term value of household on-the-job experience, and the other is that additional schooling of the girls may increase the successfulness of their marriages, given that incentives exist for males to obtain more schooling than in a static economic environment. See Becker 1981 (p. 108-111) for evidence on rising schooling levels in several countries.

Rapid technical change reduces the net advantage of an extended family structure. First, elderly males are less valuable for their extension information and because they tend to be conservative in making necessary changes. Second, there is less of an incentive for families to see that their male youth acquire farm-specific on-the-job experience. The changing technology eliminates the long-run returns to this form of human capital. Thus, it increases the frequency of nuclear families and increases the likelihood that nonfamily members will be hired to do part of the farm work and will pay more for a family's land than family members. Agricultural land and labor markets are expected to be more active than with static technology.

When social norms permit women to own property and to work in the market and they have significant market skills or when the government provides welfare payments to low income families, part of the income risk associated with marital failure is shifted from the woman's parental family to herself (possibly to her husband) and to the state. Also, when wives are not brought into extended families, the cost to the son's parents of a poor selection of a wife has relatively small costs to them. Thus, under these conditions, spouse selection is expected to be primarily an individual and not parental matter.

As economic growth occurs and countries develop, social norms for strong kinship ties weaken (Michael et al. 1980) and human capital (education and health) becomes a relatively more important form of capital than physical nonhuman capital (Becker 1981, Ch. 5; 1987). The economic incentives are for investments in human capital to occur early in life of children which occurs in midlife of most parents. These investments in children may drain most of the family's resources that would otherwise go for bequests, which means that when these parents reach old age, they may not have much of a financial cushion against unexpected illness or unusually long life, i.e., adjusting the size of bequests to take account of unexpected expenditures in old age is not good insurance (Becker 1987). Also, if parents do not expect to benefit much from these investments in human capital of their children, they may let the

state do the investing. Furthermore, when children do not feel a moral obligation to assist their parents in old age, and the parents do not have a moral obligation to invest in their children's human capital, the state frequently is called upon to raise revenues to pay for schooling of children and provide for income maintenance and medical expenses of the elderly. Thus, in industrial developed countries, the public sector tends to provide a set of social services that substitute for self-insurance provided by extended families in poor societies. The public sector tends to concentrate on public health programs, welfare and child support programs, social security, medical insurance for the elderly, and unemployment insurance.

Economic growth normally results in development of market supplied forms of insurance, e.g., automobile, fire, household, and crop insurance, and development of futures and options markets. The development of these services is part of the shift to a service oriented society that occurs when real incomes rise significantly, i.e., the income elasticity of demand for services is larger than for nonservices (Singelmann 1978). The availability of market or government insurance at favorable prices reduces the demand for family supplied insurance. With a decline in the relative importance of family self-insurance, some of the benefits of a large extended closely-knit family are reduced and nuclear families become the major family structure (Michael et al. 1980).

Skills for Adjusting to the World Economy

The world economy has a long history of positive real economic growth, and with the move to flexible exchange rates and generally increased volume of international trade during the 1970s, relatively open economies (e.g., Australia, New Zealand, United States, Canada) have become vulnerable to external shocks. The profitable years of the middle and late 1970s produced an environment in which economic agents formed incorrect expectations and made occupational choices, capital investments, and land purchases that look poor. With the low (less than one) income elasticity of demand for agricultural products, the relative importance of agriculture in gross domestic product must fall over time. Real wage rates are expected to continue a long term trend of rising and this means that the labor intensity of agriculture must continue to decline. Thus, for many countries, including the United States, almost all of the rural youth must expect to be employed in nonagricultural occupations and a significant share of the existing farmers will be forced economically to take part-time nonfarm jobs (Huffman 1986) or to leave agriculture completely. Very little has been done by American institutions to help people in agriculture and rural areas plan for the inevitable decline of the share of the labor force in agriculture (Thurow 1987). The people who leave rural areas frequently must bear the unemployment, retraining, and moving costs.

To be able to function efficiently in these conditions, economic agents need a high quality education and adaptive ability. This is not an environment where narrow technical schooling can be expected to be a good investment over the lifetime. The reason is that this vocational-technical training, including farming experience, is useful for enhancing human skills for a very narrow set of activities. When conditions change, these skills can be expected to have a much higher rate of depreciation than schooling focused upon science, math, and communication skills.

Public schools in rural areas need to change so as to offer higher quality schooling at a lower cost. A large share of rural school districts are too small to provide high quality education at a low cost (include cost of students' and faculty time). These districts need assistance in reorganizing their districts so that high quality basic education could be provided at a relatively low cost. This includes applied research on the costs of education in different size school districts and on developing organization skills for implementing re-organization plans.

The local extension service, local community colleges, and the land-grant universities could cooperate in performing local labor market analyses and providing testing and career counseling of rural adults. Both individuals and firms need information on likely local labor market conditions in the near future. This would be an aid to good decision making by individuals and prospective or expanding firms. When local labor market conditions are poor, individuals could make better decisions on whether to leave an area. For prospective firms, the local labor market information would reduce their cost of evaluating a new location. When local workers are available but they do not possess the necessary training, the local community colleges could provide the training, even if they needed to restructure their curriculum.

Adaptive ability--the ability to adapt efficiently to an environment that has been altered in a specific way--is a valuable asset in this type environment (Huffman 1985). Two aspects of adaptive ability seem to be important--market and production-related adaptive skills. Market related adaptive ability refers to ability to adapt to unanticipated changes in input and output prices. If these changes are truly unknowable, then various types of "insurance" become a means of dealing with this type of uncertainty. Given that much of agricultural technology, especially biological, is location-specific, production-related adaptive skills refer to the ability to deal with changing agricultural technology. Adaptive ability is hypothesized to be related to education of economic agents and information when the potential exists for replacing existing technology with new technology (Wozniak 1984; Rahm and Huffman 1984; Mercier 1988). Historically, the public extension service has been an important source of information about technologies for farm households. However, when schooling completion levels of economic agents are rising, the extension information that is most useful to farmers changes. One of the challenges to public extension world wide is to be flexible and insightful enough to supply information that is valuable to economic agents (Huffman 1978, 1985). This frequently means combining extension work with a very applied research program.

"Insurance" is another method for dealing with this type of uncertainty, e.g., crop insurance, commodity diversification. Thus, we expect an increase in the demand education and for institutions that help farm households manage risk.

The Life-Span Revolution

Significant increases in the lifespans of people in developed and developing countries have occurred during the past 30 years (Fuchs 1979; Ram and Schultz 1979; Schultz 1984). The changes are unmistakably

linked to the production of good health in households and have many implications for human capital investments in nonhealth forms.

Good human health has several effects in a fully developed agricultural household model. First, good health (services) enters the household welfare or utility function, i.e., better health status leads directly to a higher level of welfare or satisfaction. Good health is most likely produced by inputs of food, market health inputs, work time, and the health environment or endowment, and schooling. Good health can be expected to increase the efficiency of farm (and household) production, to increase the effective units of labor services available per day and to increase the number of days available for work or leisure over the lifetime (Pitt and Rosenzweig 1986). Thus, the implication is that the length of the lifetime can also be extended.

This model of good health has a number of implications. First, if hired and family labor are perfect substitutes (but need not be at a ratio of one-to-one) in farm production, poor family health does not change total farm labor input but there is less family labor and more hired labor on the farm. Farm output, farm profit, and farm inputs are left unchanged. Household full-income is, however, reduced by poor health, i.e., there are fewer available days for work and leisure per year and the efficiency of available family human time is reduced and the efficiency of other inputs may be reduced. Second, if hired and family labor are not perfect substitutes in farm production, as seems likely to be the case because of different skills (e.g., family members are expected to have more allocative or adaptive skills and land-specific information, and incentives, then better health will affect farm input and output decisions and the level of farm profit. It will increase the quantity demanded of family labor (measured in constant efficiency units) and increase the quantity supplied of farm output and farm profit. The effects on hired farm labor and other farm inputs are uncertain. Third, a change in the price of food--one input into the production of health--has several own- and cross-price effects which taken together are in general indeterminant in direction. A rise in the price of food (or one food group) could either increase or reduce health status. Fourth, in developing countries, the quality of drinking water or other factors determining health "environments" are key inputs in producing good health. Other things equal, an improvement in water quality will directly increase households' welfare by improving health and raise real full-incomes because of production efficiency effects and increased number of days available for work and leisure.

The expected length of life is one key variable for determining the expected returns to investments in nonhealth forms of human capital that are relatively durable (Becker 1975; Psacharopolus and Woodhall 1985, Ch. 3). In particular, if the expected length of life is only 45 years, obtaining a Ph.D. degree (requiring on average 22 years of formal schooling) is a bad investment. The period of time in which net benefits from the schooling investment are positive is too short. However, it may be a worthwhile social investment for a large share of the population to complete 4-5 years of formal schooling. On the other hand, if the expected length of life is 75 years, 16-22 years of formal schooling may be a worthwhile investment. An increase in expected length of life and days available for work or leisure increases the potential benefits to investments in formal schooling, and other things

equal, socially optimal schooling completion levels will increase. Thus, improved health status and increasing expected length of life are undoubtedly factors in raising schooling completion levels that come with economic growth and development (Becker 1981, Ch. 5). The two factors taken together--longer life and more schooling--can be expected to be major factors driving the increase in the real value of human time world wide (Schultz 1977).

Schooling undoubtedly enhances the efficiency of farm and household production, including the efficient production of good health. Females' schooling seems to be much more important for the production of good health than males' schooling, because women on average spend a much larger share of their time in household production activities that affect the health status of other family members. For example, in developing countries, infant death rates are lower and baby's weight at two years of age are on average higher when mothers have more schooling, other things equal (Psacharopolus and Woodhall 1986, Ch. 10). Some evidence also exists that the nutrition status of adults is also related to the education of the wife or adult female in the household. See Swan for review of nutrition research and implications for the production of health. Schooling seems also to be important for understanding the implications of hazardous-to-personal-health activities (e.g., smoking cigarettes, using drugs, exposure to harmful agricultural chemicals and air pollution, riding in (on) poor transportation facilities such as open or enclosed trucks) on the production of good health.

Advances in medical technology have changed the inputs and their prices for treating morbidity and mortality (e.g., diarrhea, small pox, measles), for diseases associated with aging, for emergency treatment of injuries arising from various types of accidents, and for altering the basic biology of human cells. The effects of these changes on health status and increasing expected length of life are still to be measured.

Advancing life expectancies raise issues about the productive use of the human time of the elderly. Certainly greater flexibility in retirement policies is required. It seems unreasonable to force individuals to retire twenty years before the expected end of their life. However, when leisure is a normal good, part (but not all) of the increase in available hours from the increase in expected length of life and generally improved health status will be voluntarily allocated to leisure activities. Thus, the market for purchased inputs that are complementary with leisure time, especially of the elderly, can be expected to grow rapidly in developed countries in the future.

Advancing Science and Technology

Modern economic growth is driven primarily by advances in knowledge that arise from science and inventive activity (Kuznets 1971, Becker 1987). Part of this activity is in the public sector--the general science and some of the applied sciences--and part in the private sector--much of the applied science and almost all of the inventive activity (Huffman and Evenson 1987). Much of applied agricultural sciences and agricultural inventions are somewhat geoclimatic or land-specific in their usefulness and applicability. Thus, research institutions (agricultural experiment stations) cannot directly borrow agricultural technology from similar regions but may be able to modify this

technology so that it is useful to agriculture or farmers in their region. New research is, however, frequently required.

The primary objective of modern science is the publication of (refereed) scientific papers (or their equivalent). Furthermore, modern science has a "building block" approach to discovery (Price 1986, pp. 56-81). The approach is implemented through reference citations. It is also widely accepted that modern science is layered, requiring a large number of seemingly unrelated advances in knowledge at one level before the frontier can be advanced to the next level (Price 1968). Modern science tends to unfold like peeling an onion. This layering characteristic means that resources must be allocated to a broad range of scientific disciplines in order for scientific advances to continually occur. Concentrating resources in one field or discipline is unproductive because necessary related discoveries or building blocks are frequently missing (Huffman and Evenson 1987, Ch. 5).

Science and agricultural invention can be viewed as having four important levels (Huffman and Evenson 1987, Ch. 6): general science, pretechnology science, technology invention, and technology screening and subinvention. Pretechnology science is research directed specifically toward producing discoveries that enable and assist technology invention. Pretechnology science is an intermediate product that is not generally patentable. Furthermore, pre-technology sciences link general sciences and applied agricultural sciences together in a way that speeds the incorporation of general science into the applied areas. The evidence for this comes from an examination of cross-journal reference citation patterns (Huffman and Evenson 1987, Ch. 6). Journal articles in the pre-technology science fields (e.g., journals in the fields of genetics, entomology, plant and animal physiology, environmental sciences, botany, zoology) have a relatively high frequency of citation upstream to articles published in general science journals (journals for the fields of chemistry-biochemistry, biology-molecular biology, microbiology) and to articles published downstream in the applied agricultural science journals (journals for the fields of agronomy, soils, animal science, horticulture, food science and technology).

The training of new scientists or of graduate students in the sciences is an important part of the research activities carried on by universities. Although scientific papers leave the impression that research is a very methodical and orderly process, the creative activity of discovery of new knowledge is primarily an art rather than a science (Ladd 1987; Zellner 1984). When this is the situation, apprenticeships, on-the-job training, or learning-by-doing are means of teaching. The university institution for this activity is the research assistantship. Graduate students learn about the art and science of research as they work with or for one of a small group of faculty members. Because they are learning skills that have long-run usefulness in doing research, they are willing to work for a wage that is lower than their opportunity cost in the market. Research assistantships have been an institution developed by faculty who have agricultural experiment station appointments to jointly complete research projects and to train graduate students or new scientists (Huffman and Evenson, Ch. 5).

Because of the complementariness of agricultural research with graduate education, a large share of the high quality graduate education programs

in the agricultural sciences are located in the developed countries. A successful research and graduate education program in a field seems to require at least a modest size faculty (10 to 25) and reasonably strong departments in complementary fields--pre-technology and perhaps general science fields. This means that universities in developed countries have a significant comparative advantage over ones in developing countries for providing most of the graduate training. In fact, more than 28 percent of doctorates awarded by U.S. institutions in the applied agricultural sciences since 1960 have been to individuals who are not U.S. citizens or permanent residents (Huffman 1986, p. 223; NRC 1988, p. 67). Some of these Ph.D. recipients stay in the United States or go to other developed countries to work but more than half of them return to developing countries.

The on-going rapid advances in molecular biology associated with biotechnical advances raise new issues about the allocation of scientists between the public and private sectors and between developed and developing countries. With the advances in science that are associated with biotechnology, the distance between general science, applied science, and invention has been compressed. This means that some of the advances in knowledge from research in general science leads directly to patentable forms of biological materials that are marketable (Bull et al., NRC 1984, 1988). In essence, the skills of general scientists--which traditionally have not been employed on research that has direct usefulness in the market--become extremely valuable in the private sector. The result has been a shift of some general science research and scientists trained in the general sciences out of the public and into private sector research. From the perspective of socially optimal resource allocation, this move is probably in the right direction. It is unrealistic, however, to believe that the private sector faces the right incentives in general to produce socially optimal quantities of general and pre-technology science. The primary reason is the public good aspects--the spillovers or positive external effects--of much of general and pre-technology science.

For successful regional or international technology transfers to occur, a stable political environment is required and local research. Local research is necessary because of the geoclimatic or land specificity of much of applied agricultural (especially biological) sciences. Knowledge that is directly useful in one region or country must frequently be modified before it can be successful (profitable to place in) replace existing technology. Thus, some indigenous or local research is required in almost all cases to have successful transfer of technology (Hayami and Ruttan 1985, Ch. 9; Evenson 1977).

Developing countries might find it socially optimal to borrow general and pre-technology sciences from the rest of the world and to engage in only applied agricultural science research. For this activity to be successful, the insights and imagination that are required to make this a successful process will require at least a small staff of excellent scientists. The international centers (e.g., International Rice Research Institute) are institutions that are designed to perform agricultural research on problems in developing regions at a scale and with a quality of staff that may be reasonably efficient and effective. A world labor market exists for outstanding scientific talent, and this means that developing countries and international centers must pay some

attention to world competition when they consider salaries and working conditions that will attract or retain good scientists (Huffman 1986b).

When the pace of science and technology speeds up, this causes information that farmers and households have on existing technology to become obsolete. Furthermore, farmers face the real economic decision of whether the present value of profits from adopting and using new technology will exceed the present value of profits from using existing (old) technology. This means that the production technology for farm (and household production) is not fixed; it is a choice.

Some Priorities

In the previous sections of the paper I have suggested a number of economic relationships that require economic thinking and research when it comes to public policy. Here I suggest a few areas of research that have a high priority.

1. Incorporating transactions costs and human capital investments into agricultural household models has the potential for shedding new insights on behavior. Effects of changes in availability and prices of government and market supplied insurance may be a major factor for changing family structure, family size, school attendance and completion, tendencies toward agricultural specialization (or diversity), and frequency of transactions occurring in land and agricultural labor markets.
2. Farm-specific and general skills of people in agriculture have important implications for the efficiency of adoption of new technology but also for the ease (or difficulty) of exiting from agriculture when the labor intensity of agriculture must decline in order to provide a satisfactory standard of living. We know very little about these trade-offs.
3. The production of human health is an extremely important activity of households, and it is an activity where the time and skills of women are traditionally important inputs. In a model spanning life-times, decisions on health and formal education must be strongly interrelated. These are relatively unexplored areas. Furthermore, in cost-benefit analyses of human capital projects, both direct and indirect effects need to be included.
4. The funding (and organization) of agricultural research is very important for maintaining a stream of new and superior agricultural technology that can be one source of economic growth. The public choice aspects of the funding of agricultural research, extension, and education need attention. For research, there are important issues about how national versus state funding of research, having external effects, should be funded in a socially optimal sense. Do states located in relatively homogenous regions of a large nation substantially spend significantly less on agricultural research than other states? Is the funding level closer to a socially optimal level in states that are relatively isolated from the agricultural activities of other states due to natural barriers that create major climatic differences? Are competitive tournaments more or less efficient than formula funding of agricultural research? Also, a behavioral model for showing the deter-

minants of the socially optimal allocation of agricultural research between the public and private sector when research has joint public and private uses would be helpful for viewing decisions about the appropriate place for new biotechnical and other forms of research.

5. There are alternative sources of information for agricultural household decision making, and the sources change with economic growth and development. We, however, know very little about the relative importance of farmers' schooling and experience versus public and private extension as sources of information about new agricultural technologies.

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THE URGENCY OF INSTITUTIONAL CHANGES FOR LDC, NIC AND DC AGRICULTURES*

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Four driving forces for development are: technical, institutional and human improvements along with growth in the stocks of physical and biological capital. All four seem individually essential; any one, two or even three are insufficient. Despite efforts of prominent economists to estimate separate returns to efforts to improve each of these four forces individually, their complementarity precludes reliable estimation of their separate contributions to development. When one of the four forces is deficient empirical workers find what appears to be great returns to providing the missing one because provision of it, as a missing essential ingredient, permits unused stocks of the other three to be used to contribute to the apparent productivity of the missing one. When there are no unused stocks of one, two or even three of the four forces, the provision of additional amounts of the fourth fails to generate more agricultural development as development is already constrained by one or more of the other three. This can be verified by examining the cases of oil palm technology in Nigeria and Malaysian and the minimal impacts of capital loans and grants in Africa and South America, of public administration institutes and projects in Africa and of numerous human development projects in Latin America and Africa.

It is the thesis of this paper that institutional limitations are presently the most serious constraining factor for the agricultures of the DC's and NIC's. Present stocks of technologies and of biological and physical capital are more than adequate in these countries. So too are their stocks of human capital. The LDC's on the other hand typically lack all four but are now constrained more by existing institutions and human capital stocks than by technologies and stocks of biological and physical capital. In this paper, I stress institutional constraints. It should be noted, however, that there is also a particularly strong case to be made for attention in the LDC's to human capital constraints by social scientists. There is also a strong case for overcoming biological and physical capital limitations in LDC's though, the self generation and utilization of such capital is often constrained by institutional deficiencies to which attention must first be given.

This paper is organized as follows: first the transaction costs/institutional approach to businesses and institutional history will be presented; second, the transaction cost/institutional analysis will be used to interpret what has and is happening to agricultural institutions in the DC's, NIC's and LDC's around the world and third

* LDC = less developed countries; NIC = newly industrialized countries; DC = developed countries.

conclusions and speculations will be presented about changes in agricultural institutions including opportunities to research such changes.

The Transaction Costs/Institutional Analysis of the Firm and Interpretation of Agricultural History

The institutional constraints on agriculture considered in my opening remarks are fascinating and crucially important in the affairs of all agricultures -- those of the DC's NIC's and LDC's alike. These institutional deficiencies cry out for research to permit us to promote adjustment and development and to see and better understand the future of our agriculture's. General economists and economic historians are now making considerable progress on what they term the "transaction costs/institutional" (TC/I) approach to institutional change. This approach has potential for helping us interpret, understand, overcome and adjust to the institutional constraints. In this part of this paper the TC/I approach is briefly described and examined.

Important names in the development of the TC/I approach include those of O. E. Williamson [1985], Douglass North [1981], William Baumol [1986] and Allen Buchanan [1985]. Williamson and Baumol work as economists, North as an economic historian and Buchanan as an economic philosopher. My own acquaintance with this literature is too recent and meager for me to be confident I have mastered it and am not neglecting important contributors. I also note that writers in this area describe their work as in its infancy and that they are continually culling, extending and otherwise modifying their approach. Baumol is mentioned above as he feels [1986] that Williamson unduly differentiates the TC/I approach from the neoclassical, market adjustment approach of economists to markets conceived broadly to include political processes in such a way as to accommodate the induced institutional change hypothesis of Ruttan [1971] and others. I tend to agree with Baumol about the differentiation but believe that the TC/I analysis can materially improve the induced institutional change hypothesis.

In his The Economic Institutions of Capitalism, E. O. Williamson [1985] examines how firms act and create institutional arrangements to obtain the benefits of progress while minimizing the costs of errors arising from imperfect knowledge and transaction costs. According to Williamson, transaction costs place firms in danger of making costly mistakes in the presence of asset specificity (I would use the term "asset fixity" [G. Johnson, 1958; Edwards, 1959, Johnson and Quance, 1972]), imperfect knowledge and malevolent exploiters waiting for an opportunity to take advantage of those making mistakes. In the absence of these conditions, the market mechanism (including contractual arrangements) is viewed by Williamson as capable of adequately governing the economic activities of society. In their presence, (1) transaction costs make it necessary for businesses to develop institutional arrangements to help control transaction costs and their impacts and (2) market failures are to be expected. Many of the institutions of capitalism reduce losses (both public and private) associated with transaction costs, imperfect knowledge and asset specificity.

Though Williamson views transaction costs mainly from the standpoint of management as the governance unit of a business or corporation, they can also be viewed from the standpoints of parastatal or socialized enterprises. He asserts, in general agreement with Knight [1941], that without transaction costs, imperfect knowledge and the possibility of consequent errors, a business is merely a producing unit -- a production function if you please -- devoid of management and managerial processes and adjustments and the need for institutional arrangements to manage transaction costs. In Williamson's analyses, transaction costs become important when a business uses

specialized assets in which investments can be mistakenly sunk (because of imperfect knowledge) under circumstances that offer others an opportunity to take advantage of mistakes at the expense of the management unit making the mistake. Imperfections in knowledge arise in part from inappropriate perceptions of physical, political, social and other realities some of which may be ideological in nature.

Williamson's analysis helps explain why imperfectly informed businesses (and socialized farm production units) create institutional arrangements within and among themselves to alleviate the adverse effects of the transaction costs they encounter in organizing production to acquire the gains made possible by better technologies and other improvements. It also helps explain why farmers organize themselves relative to government to induce governments to make institutional arrangements to alleviate the adverse effects of transaction costs [D. Gale Johnson, 1947].

There are transaction costs involved in changing the internal institutional structure of a production unit. In the presence of such costs, institutional arrangements also become incorrectly fixed because of errors originating in imperfect knowledge of management. The Williamson analyses shows how management units, including those of farms, seek the gains of development by devising institutions to control (1) transaction costs as the sum of assembly (or installation) and dismantling costs, and (2) the adverse consequences of making mistakes.

The transaction costs involved when a farm firm acquires or disposes of specialized productive assets such as land, machinery and livestock establish a differential between what I call elsewhere [Johnson, 1958; Edwards, 1959; Johnson and Quance, 1972] the replacement or acquisition cost and the salvage value of an asset. It should be noted and emphasized that in market controlled economies, competitive farm firms invest in highly specialized and durable assets in unstable, almost unknowable, changing environments surrounded by a competitive market that opportunistically but not malevolently takes advantage of the investment mistakes of farmers. It is also noted that the managers of socialist farm units and agricultural systems, like their counterparts in privately managed agricultural sectors, encounter transaction costs in using specialized agricultural inputs in which they, too, often erroneously sink large investments because their knowledge is also imperfect under circumstances that give others in their bureaucracies an opportunity to take advantage of their mistakes.

In his book entitled Structure and Change in Economic History [1981], Douglass C. North stresses the cost of changing institutions in interpreting history. A rather concise summary of his argument is to be found in the Journal of Economic History [North, 1984] entitled "Government and the Cost of Exchange in History." In a still more recent article entitled "Institutions, Transaction Costs and Economic Growth," North points out [1987, pp 255-256] that economists commonly ignore transaction costs and imperfect knowledge. The extensive use of this approach by economic historians in the years before 1984 led them to neglect the institutions society develops to handle transaction costs. North argues that economic historians must now use the TC/I approach in interpreting history to go beyond the economic analyses commonly taught to undergraduate and graduate students and used by economists.

Whether North's criticisms apply to the analyses of all economists is not particularly relevant here as it certainly applies to the work of many. I have pointed out long ago and elsewhere that many economic analysts ignore acquisition cost/salvage price differentials for investing and disinvesting in durable productive assets [Johnson, 1958; Johnson and Quance, 1972]. These differentials are determined by transaction

costs. In my analysis, such differentials combine with imperfect knowledge to help explain asset fixity, changes in length of run, irreversibilities in supply and input demand functions, opportunity costs, private and social losses on sunk costs, and the like.

North is concerned with changes in public institutions. He argues that four variables must be taken into account in understanding institutional change and lack thereof. The four variables are first, the cost of measuring the goods and services exchanged and the performances of persons and agencies. Second, the nature of the exchange process, that is whether it is personal or impersonal. The third is enforcement of agreements in order to avoid cheating, opportunism and shirking. The fourth includes ideological attitudes and irrationality. North's list is related to William's list that includes asset specificity, imperfect knowledge and opportunism.

Both public and private institutions to control transaction costs are put in place at a cost and, in turn, can generally be dismantled only at a cost. In this sense institutions are like tractors, irrigation systems, breeding herds and orchards. Governments and/or businesses incur transaction costs in establishing and dismantling institutions much as firms encounter transaction costs when investing and disinvesting in lumpy durable factors of production. Institutions are both informal and formal, the former being illustratable by credit ratings among businessmen well known to each other and the latter by the acreage diversion program of the USDA. Transaction costs are involved for both kinds of institutions. For the remainder of this paper, I shall refer to the costs of establishing and dismantling both kinds of institutions as "institutional transaction costs" and to the costs of putting durable productive assets in place and of dismantling them as "production transaction costs." This terminology goes beyond that of North and Williamson to provide us with words to describe more adequately the institutional and investment constraints facing agriculture around the world.

At this point in the discussion, economists may argue that all that is required to explain institutional changes is to broaden the usual concept of markets to include political "markets" to include the "induced institutional change hypothesis". North would object, however, as such explanations leave out institutional transaction costs and the roles that imperfect knowledge, irrationality, mistaken choices, ideological commitments and opportunistic use of political, military and other kinds of power play in forming governmental institutions [North, 1981]. He argues that "political systems have an inherent tendency to produce" institutions involving "inefficient property rights or decline" [North, 1981, p. 422]. By contrast the induced institutional change hypothesis can generate only correct improvements when transaction costs are treated as zero and knowledge is regarded as perfect [Ruttan, 1971, 1984]. In North's analysis transaction costs and imperfect knowledge lead to the establishment of mistaken institutions. Thus, North's analysis provides a much better explanation of how the present mistaken price support, subsidy and import protection institutions of Japanese, Western European, North American, Korean and Taiwanese agricultures came about. North's analysis is also useful in understanding the roles past mistakes have played in creating the agricultural institutions of mainland Chinese, the Soviet Union Eastern European socialist countries, Tanzania and Cuba [Csaki, Boyev, Li, Symp. Papers]. It also helps us understand the difficulties encountered in overcoming the institutional short comings of less developed African, Latin American and Asian countries. It should also be noted that economists commonly ignore the gains and losses of investments mistakenly sunk in durable biological and physical capital.

North and Williamson certainly make a valid point in calling our attention to (1) how dangerous it is for historians (and economists) to disregard transaction costs,

imperfect knowledge, irrationality and ideology and power in analyzing institutions and (2) the value of the TC/I approach in studying history.

Insights from the Transaction Costs/Institution
Analyses About Institutional Changes in the Agriculture
of the LDC's, NIC's and DC's Around the World

In this section I draw heavily on two recent conferences: one in Beijing last November on Rural Development Strategies that was sponsored by the International Association of Agricultural Economists (IAAE) and the Chinese Society of Agricultural Economists (CSAE) and another in Taipei in January of this year on directions and strategies in the Asian Pacific region. Over 50 papers were presented at the first and another 26 at the second. Both conferences placed heavy stress on institutions and institutional changes. I also draw on my own U.S. [Johnson and Quance 1972], Nigerian [Johnson et.al. 1969] and Korean [Rossmiller et.al. 1972] studies as well as studies by others including those on growth and equity that were summarized at the Jakarta Conference of the IAAE [Johnson, 1983].

Institutional transaction costs (both when high and low) have been important for the agricultural decision makers of mainland China and the Asian NICs. High institutional transaction costs (including those of a civil war) were paid by mainland China to change land tenure institutions and redistribute the ownership of land from feudal landlords to peasants. Transaction costs short of war were also incurred in reforming the land tenure institutions of Taiwan, South Korea and, earlier, Japan. Further, large institutional transaction costs were incurred in dismantling the original land reform of socialist China so as to reconcentrate land ownership in the hands of the state under the control of the Communist Party of China. Subsequently, in the late 'seventies both institutional and production transaction costs were incurred in dismantling a substantial part of the state farms and communes as production institutions in order to pass control, if not ownership, of land back to individuals and families under the "responsibility system." Investments in both biological and physical capital in the agriculture of socialist China were low during the cultural revolution -- so were earnings on these investments; consequently, the dismantling and disposal of production durables done at the end of the cultural revolution did not involve much loss of productive value. This helps explain the exceptional volatility of China's agricultural institutions since the end of the cultural revolution. In post-1978 socialist China, agricultural reforms have been and are being sought to alleviate difficulties related to North's four variables: performance measurement, exchange processes, enforcement of agreements, and ideologies and irrationality.

I turn now to Japan, South Korea, and Taiwan. Their institutions have long been favorable for agricultural production. South Korea has now found that her earlier land reform institutions fragmented land ownership and control so much that farmers do not now have units large enough to produce incomes comparable to those being received by industrial workers. Thus, like socialist China, South Korea is now encountering the institutional transaction costs involved in partially dismantling her earlier land reform. Japan and Taiwan are also encountering dismantling costs in partially changing their land tenure institutions. More fundamentally all three attained high degrees of food self-sufficiency and security by heavily subsidizing their agricultures and/or granting them high and tight import protection. In agreement with Williamson, I have argued and presented supporting empirical work elsewhere [Johnson, 1958; Johnson and Quance, 1972] that asset specificity and imperfect knowledge of continuous change (technical, institutional and human) create problems for farm entrepreneurs involving the transaction costs that make up the differences between acquisition costs and salvage

values of assets. Though Williamson is not very explicit about it, "sunk costs" become problems only when they are in overcommitted resources whose earnings do not cover the transaction costs involved in acquiring them. Nor is he explicit about opportunity user costs that are part of the economics of extracting service flows from fixed durables [J.M. Keynes, 1936; A. Lewis, 1949; Baquet, 1978, pp. 95-122; Robison and Abkin, 1981]. Services from sunk assets earn opportunity costs or shadow prices insufficient to cover original stock acquisition prices. The uses of the services of sunk assets are governed by current shadow or opportunity cost and, sometimes, salvage values (or off-farm opportunity costs); however, capital loss, cash flow, leverage and bankruptcy problems are created by historical acquisition costs of fixed or sunk assets. It is easy to demonstrate, both theoretically and empirically [Edwards, 1959, 1985; Johnson and Quance, 1972, appendix], that random mistakes made as a result of imperfect knowledge when investing in "specific" assets with transaction costs for acquisition and disposal generate a tendency to outproduce effective demand even in the absence of price supports and input subsidies. Since World War I, U.S. agriculture has outproduced effective demand in all but around eight years in the sense of producing so much that market prices did not cover acquisition costs of investments and expenditures. About thirteen of the fifty-two years of overproduction were in years before the present series of production controls and price support programs was established. It should be remembered by those who correctly blame much of our overproduction on price support and subsidy programs that we overproduced before these programs existed and that overproduction currently typifies many farm commodities for which such programs do not currently exist [Johnson, 1985]. The original need was (and the continuing need still is) for programs to help farmers handle transaction costs and the investment mistakes they inevitably make because they are not perfectly informed. What they need is institutional arrangements to do this that do not oversupport and oversubsidize and, hence, add to overproduction problems. With supports and subsidies, it is again easy to demonstrate (both theoretically and empirically) that entrepreneurs tend to overprice land, overinvest in non-land capital, overcommit labor and overproduce the effective demand inherent in the price support and subsidy institutions. Whether or not Taiwan, South Korea and Japan are importers, self-sufficient, or exporters of food and feed grains, their farmers should be expected to overinvest in agricultural production durables, overprice land and overproduce the effective demand they face within their subsidized and protected systems and, of course, relative to international demands.

The subsidies and assistance given to South Korean and Taiwanese agriculture by their respective agricultural institutions are less extensive and less expensive than those for Japan. Japan's agriculture is probably more heavily subsidized and protected than the agriculture of any other developed country [USDA, 1987]. She is followed by the EEC countries. In North America, subsidies for farm products are not as high as in Western Europe. However they are high enough to have created surpluses and raised governmental costs to levels increasingly questioned by U.S. taxpayers. Apparently, subsidies for Canadian farmers roughly comparable to those for U.S. farmers are less obvious to Canadian than U.S. taxpayers and consumers in part because the Canadian costs are paid from provincial as well as federal treasuries. The agricultural products of Oceania are probably less subsidized and protected than those for any developed country [USDA, 1987]. One cannot examine the institutions of the DC's and Asian NIC's without acknowledging the realism of Douglas North's concern about irrationality and mistaken institutions. Many of the North American production control and price supports were designed originally to stabilize production prices and income so as to protect farmers against losses arising from imperfect knowledge and transaction costs. However, North American farmers and politicians went beyond needs for such protection to price support and subsidy levels unjustifiable on these grounds much as their Western European,

Japanese and Asian NIC counterparts went to price support and subsidy levels and import restrictions unjustifiable in terms of food security goals.

The agricultures of the developed western non-socialist countries now have mistaken institutions for subsidizing and protecting agriculture that were put in place at substantial institutional transaction costs. To be included in the costs of establishing these institutions are the costs associated with increases and decreases in the value of farmland [Lowenberg/DeBoer, 1987; Boyne, 1964] and production quotas and over-investments in other assets. If and when such institutions are dismantled in response to taxpayer and consumer dissatisfaction, high dismantlement costs will be incurred. These will be both private and societal in nature. Understanding such costs will be improved if they are researched by rural sociologists, rural political scientists, rural anthropologists and agricultural geographers as well as agricultural economists. Included in dismantlement costs will be the destruction of property values based on the price support, production control, and import protection institutions now in place [Lowenberg/DeBoer, 1986]. But this is not the end of the matter as foreign exchange control and related institutions that protect non-farm producers and laborers are also in place especially in the Asian NIC's, Japan, and Western Europe, some of the most troublesome of which involve governmental deficits and foreign exchange regulation. Deficit financing and exchange controls inflate prices, distort price relationships and redistribute property values particularly in the LDCs and NICs.

At the recent joint conference of IAAE and CSAE economists, Li Renfeng [Symp. Paper] of the Institute of Soviet and East European Studies of the Chinese Academy of Social Sciences presented a very interesting paper entitled "Problems of Rural Reform in the Soviet Union and Eastern Europe." Li's paper stressed the early dominant role of Soviet agricultural development thought in organizing agricultural production in socialist Eastern Europe as well as in the Soviet Union itself. The main defects of the earlier Soviet approach were summed up by Li as those of (1) implementing socialist planned management in an "absolute" way using standard planning indexes to create a plan with the "effect of law" for implementation by all production organizations, (2) ignoring the "active role of commodity production" as if the Marx/Engles assumption that commodity production had disappeared were true when, in fact, it is not, and (3) disregard of benefits for farmers and the need for a certain amount of equality in the distribution of income between farmers and non-farmers in order to motivate farmers, farm laborers and the managers of agricultural production enterprises.

Li indicates that the USSR and Eastern Europe started reforming their agricultural systems away from the original Soviet pattern in the mid-1950s. These reforms reduced the compulsory use of planning indices and the granted more power to local decision makers particularly at enterprise levels, reduced use of compulsory selling systems and raised purchase prices for farm products, reorganized machinery and tractor stations and enterprises for producing farm inputs, and partially shook off rural collectivization in favor of rural cooperatives. Li indicated that agricultures of the USSR and eastern socialized countries, still remain the "weak point in their economies." He did not consider institutional dismantlement costs and sunk production investments as possible explanations of the slow pace of reform in agricultural institutions of Eastern Europe and the Soviet Union but, then, he did not have access to the Williamson/North transaction cost analysis of institutional change.

The TC/I approach is useful in understanding the slowness of rural institutional reforms of the Soviet Union and in the socialist Eastern European countries. Those reforms are encountering considerable resistance to keep agriculture the weak point in

the economies of these countries. Such resistance should not be surprising. In these countries, agricultural institutions and systems have been moderately stable and passably workable for a long while. People have found niches where they collect benefits (rents) that increase with development and specialization. Even urban consumers benefit from low food prices if not from high quality, diversity and quantity. Further, powerful party members and military leaders are conservative Marxists who fear that institutional change may deprive them of power and other benefits. In Poland, both agricultural and non-agricultural reforms have been staunchly resisted by the party and government.

In Hungary, reforms in rural institutions came easier. This makes it appropriate to follow consideration of Li's more general paper about the agricultures of East European, socialist countries with consideration of a well-written, carefully considered paper about Hungary presented at the same conference by Csaba Csaki [Symp. Paper], Rector of Karl Marx University of Economics in Budapest. As one reads Csaki's paper, one can grasp the adaptive conservation of Hungarian agricultural planners as they made their agricultural reforms. Hungary did not abandon her state and cooperative farms. She did, however, become more flexible and adaptive with respect to them. Her institutional reforms transferred to the managers of state and cooperative farms much decision making power and operational control that had previously been exercised from Budapest. Further, farm product prices and rewards for work and accomplishments were increased and placed under local control. Some land is owned by cooperatives and some by their members. Though the Hungarian government continues to place heavy reliance on large-scale production units operated as state farms or cooperatives, Csaki reports that there are half a million plots and small farms under cultivation. He does not attribute the diversity of Hungary's agricultural production organizations to the supremacy of small-scale farming. Instead, he notes that the large-scale state and cooperative enterprises produce most of the grain, sugar beets, sunflowers and green forages. On the other hand, smallholder operations are important for vegetables, fruit and wine. Livestock production is distributed among both large- and small-scale units with the small-scale producers being relatively more important for pork, eggs and rabbit meat. Even the large-scale farms of Hungary are regarded as dependent on technical assistance. They are served by institutions known as Technically Organized Production Systems (TOPS). In turn, the large farms provide technical assistance to the smaller ones. Csaki reports that Hungary is developing a large number of intermediate organizational structures including a wide variety of "joint" ventures. Some of the joint ventures are cooperatives and some are legally and financially independent enterprises. Joint ventures provide construction, food processing, marketing and other services to the farm as well as the non-farm sector.

Hungarian agriculture is more outward oriented than that of most socialist states somewhat resembling, in this respect, South Korea and Taiwan. A very high proportion of Hungarian land is cultivatable. Because she has virtually no other renewable natural resource to use in earning foreign exchange, it is important that Hungary use her land so as to earn foreign exchange from both within and outside socialist countries. Csaki characterizes Hungary's agricultural institutional reforms as: (1) based on "voluntary gradualness" on the part of decision making units, (2) granting much independence from central control to local decision making units, (3) recognizing a national financial interest in the productivity of agriculture, (4) stressing socialist democracy and (5) requiring substantial state support for Hungarian agriculture. Hungarian policy makers: rely on Hungary's agricultural and food industry to meet all of the increasing demands of its citizens for the products its agricultural system can produce; regard socialist, large-scale enterprises to be the basis for increases in production and the fundamental pillars of the Hungarian agricultural system; rely heavily on agriculture in achieving the socio-economic and financial possibilities of the country; regard small-

scale agriculture as an integral part of Hungarian agriculture; stress the non-agricultural and service activities of its agricultural enterprises; encourage a multiplicity of diverse enterprise types within agriculture; and, lastly, rely heavily on the independence of enterprise managers pursuing their unit's financial material interest to replace earlier more centralized management procedures and institutions. The reforms of Hungarian agriculture seem to have rather carefully taken into account institutional and production establishment and dismantlement costs and to have done so in a manner that has avoided many potential institutional mistakes for Hungarian agriculture.

V. R. Boyev, Director of the All Union Scientific Research Institute of Agricultural Economics, presented a paper entitled "The Strategy of Development of Agro Industrial Complexes in the USSR" [Symp Paper]. Boyev's brief written paper contained little in the way of specific references to reforms in Soviet agriculture. "The general task" he indicated "in agricultural development and development of agro-industrial complexes is to concentrate production in places with the most favorable and natural economic conditions and to carry out a socio-economic policy which can be regarded as fundamental principles for development of agro-industrial complexes." This implies that managerial forms and production organizations must be flexible. In his ad hoc public remarks at the Beijing symposium, however, Boyev placed much greater emphasis on the reforms he described verbally as now being put in effect for Soviet agriculture. He placed even greater emphasis on the importance of successfully carrying out Gorbachev's view of how to manage the Soviet economy in general and its agricultural sector in particular. He also recognized implicitly the high transaction costs and dangers of making institutional mistakes in carrying out these reforms.

Viewed from the perspective of transaction costs, reforming Soviet agricultural institutions is understandably slow. The Soviet system has been in place for decades and the party and the government it controls have vested interests in it. The individuals who manage present Soviet agriculture institutions also have vested interests in those institutions. Further, there are extensive sunk investments in physical capital specific to the needs of the present institutional structure of soviet agriculture -- state farm facilities and the like. Institutional reforms for Soviet agriculture involve more dismantling costs than they did in socialist China and Hungary. Hence, reforms are likely to be marginal, more gradual and much less extensive than those in China since the demise of the "Gang of Four" and probably less significant than the conservative gradual reforms of Hungary.

The U.S. plays a difficult, troublesome institutional role in trade and international finance that is important for the agricultural systems of the world. She is a major country. Her monetary unit, the dollar, denominates most international transactions. Deficit financing by the U.S. government affords many opportunities for other countries and the U.S. itself to engage in what North [1981, p. 36] and Williamson [1985, pp. 31-2] refer to as malevolent "opportunism." The U.S. is now the world's largest debtor nation. For several decades Western European countries, Japan, some of the Asian NICs and the petroleum exporting countries have built up productive capacity, reduced indebtedness and/or built up their dollar reserves from U.S. reconstruction assistance, military expenditures in Europe and Asia, war expenditures and, more recently, by running trade deficits against the U.S. They made their dollar reserves good first by cashing them in against U.S. gold reserves (until those became inadequate in 1971 for this purpose); then by purchasing U.S. securities, stocks and real property; and lately by loaning their dollar reserves to the U.S. Treasury to cover U.S. fiscal deficits. The holders of Euro-, petro- and Asian dollars have suffered losses from depreciation of the U.S. dollar in a number of rather dramatic instances and the U.S. (including its consumers) has opportunistically

taken advantage of such losses. However, it is also true that the two U.S. deficits (fiscal and trade), reconstruction assistance, military expenditures, developmental assistance including concessional loans and sales and, in some instances the general schedule of preferences (GSP) have permitted Japan, Korea, Taiwan and Western Europe to "prime their economic pumps" opportunistically almost since W.W. II in ways that have promoted their growth and prosperity. The U.S. did (or permitted) this in order to help rebuild Western Europe and Japan and to help create the present economies of South Korea and Taiwan as part of a stronger free world. In addition, there has been an almost conscious collusion between those in the U.S. who wanted to use fiscal deficits to fund the domestic, international and military programs of the U.S. and those in Japan, Western Europe, Korea and Taiwan who wanted to run trade surpluses with the U.S. to expand their own economies.

Whether or not the above view of the historical roles of the U.S. fiscal and trade deficits is accurate, it appears that the decades long era of U.S. fiscal deficits and unfavorable trade balances is going to have to end. When it does, there will be major adverse impacts for Asian NICs, Japan and the DCs of Europe that have become highly dependent on benefits from the two U.S. deficits. The recent stock market disaster and the current plunge in the value of the U.S. dollar attest to the major transaction costs that may be ahead as the West European DCs, Japan and the Asian NICs face the necessary adjustments in their fixed investments and institutions. Institutional changes with high transaction costs will be needed.

Socialist China and India are both large LDC's. They also share a history of being internally rather than export oriented. Socialist China now seems to be moving to more of an export orientation. If the above view of the possible impacts of eliminating the U.S. fiscal and trade deficit has any validity, the U.S. is not likely to be willing and able to run trade deficits large enough to bestow on socialist China benefits comparable to those bestowed in the past on Western Europe, Japan, Taiwan and South Korea. The same would also apply to India were she to become as export oriented as Japan, Taiwan and South Korea. Socialist China, India and, indeed, Japan, Western Europe, Taiwan, and South Korea must now consider producing more for their own markets and prepare for more balanced trade with the U.S. It is likely true that Japan, Western Europe, Taiwan and South Korea are substantially overinvested in export-specific assets (automobile factories, steel mills, shipyards and the like) targeted on the U.S. market. These investments may have to be revalued downward and allocated on an opportunity cost or shadow price basis in the future in ways that will impose significant capital losses on their owners.

Generally the agricultures of the LDC's of Africa, South America and the Middle East suffer at least as much from institutional constraints as from lack of technology. They are also severely constrained by lack of human capital. Further, this lack and inadequate (sometimes corrupt) institutions tend to foreclose the self generation and use of much biological and physical capital. The same is true for the effective use of the borrowed capital and capital grants. Some LDC's (Tanzania, Cuba, Angola, and Nicaragua) have followed the earlier Soviet institutional pattern with even less success than the Eastern European socialist countries. Cuba paid high transaction costs to establish her socialist institutions. Such costs were lower in Tanzania (who avoided war) than in Cuba, Angola and Nicaragua. Tanzania, like China after the Red Guard period, now appears to be paying only moderate dismantlement costs in shifting away from some of her least appropriate (and least productive) institutional arrangements. In the rest of Latin America and Africa a difficult quest is on for new institutional arrangements. Unlike Taiwan, South Korea, Western Europe and Japan after W.W.II, some of these

countries lack the human capital required to devise and effectively update their agricultural institutions. Further even if they have the human capital, they are unlikely to be the beneficiaries of the large scale U.S. reconstruction, developmental and, even, military expenditures that helped those countries reconstruct and build. Still further Latin American and African countries face a U.S. that is already absorbing more imports than she is paying for. The U.S. cannot and the historical records of Japan and Western Europe indicate that they are unlikely to open their markets to prime the pumps of Latin American and African LDC's. Like India and China, these LDC's are likely to have to follow the slower route of tailoring their institutions, industries and agriculture to fill their own domestic needs while competing in a subsidized restricted world for limited export opportunities. But that is not the end of the matter -- Japan, Western Europe, and the Asian NIC's are likely to be adversely impacted and in turmoil because of institutional changes (agricultural and other) forced on or taken by the U.S. This turmoil is likely to affect LDC agricultural sector states more adversely than it does those of Japan, Europe and the Asian NIC's.

Unmet Needs for Reforms in Agricultural Institutions Including Research Opportunities

A. From the above, the following conclusions can be reached:

1. The agricultural institutions of the DC's, NIC's and LDC's are in such disarray that institutional deficiencies impose more important constraints on agricultural production and adjustment than lack of available technologies and biological and physical resources. Human resource limitations are probably less constraining than institutional deficiencies but more constraining than the limitations of technology and bio/physical capital and resources.
2. The institutional deficiencies for DC and NIC agricultures are such that resolution of the institutional deficiencies of LDC agricultures depends on how, when, and if the DC's (particularly the U.S.) and NIC's resolve theirs.
3. It is important, therefore, that agricultural institutions be researched to improve our understanding of institutional changes to assist in their modification and improvement. The need for improvement is both domestic and international. Internationally, the need exists at least as much for the DC's and NIC's as for the LDC's. These two institutional worlds are so closely related however that they must be researched together as intradependent parts of a whole.
4. Without improvements in the agricultural institutions (formal and informal) of the LDC's, the improvement and development of their agricultures will be so limited by institutional constraints that effort to develop their agricultural technologies, physical and biological resource bases and even their people (human capital) will have only limited impact -- nonetheless such efforts should not be curtailed for reasons given in section 7 below.
5. For researching institutional change, the induced institutional change hypothesis commonly used by Ruttan and Hyami needs to be extended so as to include more fully the Williamson/North transaction costs/institutional approach. So extended it will better explain institutional rigidities and flexibilities, mistaken institutional changes and make us keenly aware that all induced institutional changes should not be expected to be improvements.

- a. Institutional establishment and dismantlement costs make up transaction costs with respect to institutions. Institutions also affect production transaction costs for durable productive assets. Production transaction costs combine with imperfect knowledge to generate costly investment errors. Similar errors are made in establishing agricultural institutions.
 - b. As a consequence of "a", immediately above, "market failures" are to be expected when investments are made in:
 - durable production assets and
 - institutional arrangements.
 - c. Understanding these two "market failures" requires more than economics because both the costs and returns of these failures are not fully understandable if their societal, anthropological, geographical and political dimensions are not researched and investigated.
6. Section 5c above makes cases for rural sociological, rural political science, historical and rural anthropological research as well as agricultural economics research on institutions.
 7. While the world's agricultural situation examined in this paper establishes a very high priority for research, extension, advisory, consulting, administrative and assistance efforts by rural social scientists to understand and improve agricultural institutions, we should not substantially diminish our efforts to improve agricultural technologies, agriculture's natural and man-made physical and biological resources and human agricultural capital. Success in overcoming institutional limitations along with consequent increases in per capita income, and larger populations will lead to a need for better technology, more biological and physical resources and improved human capital in the future as institutions are improved.
 8. In effect, the above calls for additional world wide expenditures on agricultural development, research, extension and administration. Much of the development expenditures can and should be in private sectors. Generating new technology, natural resource development and conservation, the building of bio/physical capital bases, and human development are long term processes not to be curtailed in the short run. This means that for the most part we cannot reallocate research and other resources from other parts of agriculture to institutional research and other efforts to meet the urgent institutional challenge described herein. Either now or after our institutional failures become still more drastic and demanding than they are now, we are going to have to address the failures of our agricultural institutions with many more resources than are now devoted to this end.

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Li, Renfeng. Professor, Institute of Soviet and East European Studies, CASS. "Problems of Rural Reform in the Soviet Union and Eastern Europe."

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THE RELATIONSHIP BETWEEN INTERNATIONAL RURAL
DEVELOPMENT AND INTERNATIONAL TRADE AND FINANCE

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paper contributed to the Social Science Agricultural
Agenda Project (SSAAP)

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Contents

1. Introduction
2. Structural changes in agriculture and the world economy
3. Increased linkages between agriculture and the non-farm sectors
4. Increase linkages among agricultural sectors in the world economy
5. Policy issues arising from trade and financial linkages
6. Research needs for better policy making

THE RELATIONSHIP BETWEEN INTERNATIONAL RURAL DEVELOPMENT
AND INTERNATIONAL TRADE AND FINANCE

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Introduction

It would, not too long ago, have been necessary to begin a paper with this title by emphasizing the importance of international trade and financial developments on rural life. Such an introduction now seems superfluous. The case has been made extensively in recent years by writers on agricultural policy issues, and it would have been apparent to the casual observer even if the profession had chosen to ignore the matter. Among the papers given at the Phase I workshop was an extensive treatment of the topic by Schuh under the heading of "International Development and Affairs" (Schuh, 1987) and similar themes were echoed by Hillman in his paper "Social Sciences in a Global Context" (Hillman, 1987). Schuh in particular has been influential in broadening the discussion of agricultural development and agricultural policy to include the trade and macroeconomic environment in which national agricultural sectors operate.

Just as it is not necessary to repeat the case for broadening the agenda so it is not sufficient to stop with a description of the ways in which trade and macroeconomic events impinge upon agriculture. The case has been accepted: the

task is now to devise policies which are appropriate in the current environment, realistic in terms of their objectives and acceptable to those most affected by their implementation. The social sciences clearly have a role to play in analyzing the situation, informing the participants of their conclusions and exposing misleading arguments. This is a substantial agenda. In this paper I shall confine my arguments to the economic dimensions of the subject, and hence focus on the agenda for the agricultural economics profession. Other disciplines also have an important role to play in understanding these issues, but if I tried to articulate those roles it would be more likely to expose my own ignorance rather than shed light on the subject.

The paper will begin with a description of why the linkages between trade, monetary and agricultural conditions are more important and apparent now than in the past. Changes in the structure of both domestic economies and the global economy play a role in this. The linkages themselves will be discussed in two parts. The first part will deal with agriculture's links with the non-farm sector and the second part with inter-agricultural links through commodity market trade. Though clearly related, these two issues raise somewhat different policy questions. After a brief look at the likely continuation of trends toward greater market integration, the issue of policy response is addressed. The paper ends with some tentative ideas on research priorities, as a lead into the more intensive discussion of this topic at the Conference.

Structural Changes in Agriculture and the World Economy

The world economy has been in a state of flux in the past fifteen years.

Commodity prices have boomed and bust (twice, in the case of sugar); oil prices have jumped on two occasions, causing major economic disruptions in the majority of countries; inflation soared in the 1970s and was brought in check by stringent and expensive policy adjustments in the 1980s; the dollar fell, rose and fell again; many countries became heavy debtors to the world's capital markets, including some that had previously supplied capital; and trade markets have hovered between protectionist retrenchments and rapid growth. In such an uncertain world, standard economic analysis seemed often to be misleading and conventional prescriptions unhelpful. Policies that had performed well in the past suddenly became an embarrassment. New policies had to be fashioned to deal with the new reality. This period presented a significant challenge to economists as well as to policy makers.

Compared with the stability of the previous eighteen years, the period of steady growth following the Korean War, the volatility is remarkable. What is more significant is that it coincided with another development, the growing interdependence of national economies through "global" markets for goods and financial instruments. The two developments are not unconnected. For example, the emergence of an offshore capital market, the Eurodollar market, greatly facilitated the tremendous increase in borrowing of the 1970s and early 1980s, which in turn led to the present debt burden of many developing (and some developed) countries. Those markets recycled funds generated by oil price increases. The adjustment problems arising from price shocks were dissipated more widely as a result of this integrated capital market, just as the market itself became more global in scope to accommodate the shocks.

The development of global markets has had three main components: the expansion of trade, the integration of capital markets, and the liberalization of exchange rates. Manufactured trade has expanded at a faster rate than GNP over most of the period since 1960. For many types of trade, tariff barriers around the major industrial markets are either zero or too low to act as a major impediment. Non-tariff measures abound, but have not been able to halt this process. Developing countries--in particular those in Asia--have participated actively in this expansion. For developing market economies as a whole (a category used by international organization to refer to all developing countries except the Asian centrally-planned economies), manufacturing exports are now more important than primary (non-oil) commodities (Josling, 1987). African countries have not participated in this trade expansion, a fact which is itself a major cause of the severe economic problems in that region.

The internationalization of capital markets, both private and public sector borrowing and lending, has radically altered the global economy. It has been estimated that outstanding credits in the Euro-currency market reached \$1.7 trillion by the early 1980s (Schuh, 1984). This financial market has swamped the market for foreign exchange--traditionally needed for financing trade balances--which now has to handle enormous flows of funds among the major economies in the course of a year. One implication of this is that fiscal policy, the management of the government's budget balance, has a new significance. Once fiscal policy was mainly an internal problem: how the government balanced its books had an impact on the domestic economy but was of little interest abroad except in so far as it influenced growth rates. Now the budget deficits of the major countries are the subject of international

discussion. National debt is as likely to be held by foreigners as by domestic individuals and institutions.

The third leg of the somewhat rickety global stool is the liberalization of the foreign exchange markets themselves. Set loose in the 1970s from the Bretton Woods constraints, exchange rates have floated--more or less cleanly--ever since. Responding as much to interest rate differentials as to trade balances, exchange rates of the major industrial countries have been on a roller coaster. Developing countries often peg their own currencies to that of one of the major countries, and hence get taken along on the ride. Exchange rate fluctuations in many cases are more important than trade barriers in determining the profitability of imports and exports. Such volatility can mask for several years the underlying trends in productivity and competitiveness that are supposed to determine trade flows.

In parallel with this rapid development of global markets, another development has been taking place within national economies. This process is also one of integration and interdependence. In the developing world the transformation of agriculture from a traditional and largely self-contained sector to a participant in the larger process of exchange, either through markets or through planning decisions, has been progressing apace. All except a handful of countries, many of them in Africa, have now undergone this transformation process. Farmers increasingly provide for a market outside their own village and region. In turn, they purchase both productive inputs and consumer goods from other sectors. This market-oriented agriculture, rather than subsistence farming, is now the norm. Governments have created this environment by

providing incentives, capital goods and education: they have also relied on it to feed a growing urban population. This process has been encouraged by the renewed confidence in policy makers and economists in the ability of agriculture to provide an engine of growth.

In the older economies an equally remarkable change has taken place which has been less heralded. In the mature economies the integration of the agricultural sector with the rest of the economy has also been proceeding rapidly. Indeed in many cases this process has reached the stage where it is no longer clear where to draw the boundaries of the agricultural sector. The proportion of the labor force in agriculture has continued to fall. In many countries is less than the unemployment rate. Even those that remain "in agriculture" earn, in many cases, the greater share of their income from non-farm sources. Part-time farming has become a way of life in a number of industrial countries, rather than an aberration of the urban fringe. The transportation, processing and retailing of food is usually a larger employer of labor than farming.

The full-time farms that remain in this new agricultural sector are capital intensive, technically sophisticated, medium-sized businesses. They pay the going wage for labor, compete for capital with other businesses and earn roughly comparable rates of return on managerial skills and equity capital. Where such management is allied to land ownership, considerable risks are involved, much of them related to the course of government policy. But the business of farming is increasingly viewed as but one of a number of competing uses for land and rural labor. In such economies the transformation of

traditional agriculture is essentially complete.

Implication of Increased Linkages between Agriculture and
the Non-Farm Sector

The development of global goods and capital markets implies that events in one economy spill over into others--for good or ill. The transformation of agriculture to a market-based sector means that these influences will be felt by farmers and rural families as well as by governments and city-based industries. The result of the combination of these trends is to pose both developing and developed country agriculture a number of problems--as well as offering possibilities--which come along with interdependence. In general the problems and possibilities arise through the level and stability of prices, of output and inputs. Domestic macro-economic policy will also influence these prices and those for labor and capital. If the goods are tradeable, then exchange rate variations will also potentially influence their price. Although these influences can be positive as well as negative, it is the adverse impacts that naturally demand more attention. A brief description of the linkage may be helpful.

Exchange rate influences are perhaps the most pervasive and least understood link between monetary and trade developments and agriculture. The exchange rate acts as the pivot between the internal economy and the external world. Imbalances occur when this pivot is out of place. A controlled economy can sublimate exchange rate imbalances within the trade and financial organs of the state. In such circumstances their impact on the domestic economy is indirect and obscure. In a closed economy the exchange rate plays a shadowy role; it

exists as a concept without any practical significance. In a colonial economy, where no independent currency exists and no autonomous monetary policy is possible, exchange rates are mere accounting conventions. But in an independent, mixed, open economy the role of exchange rates is crucial. As more countries opt for autonomy in economic affairs and openness in commercial relations, the exchange rate gains in importance.

The exchange rate directs in essence the price ratio between traded goods and non-traded goods and services. Governments rarely leave such price levels entirely to the market place: not only the exchange rate itself but also the domestic price levels are often controlled. As with any controlled price, the secret is to choose the right level: problems rapidly build up if this price level is set at an unsustainable level. Two situations are common in developing countries which illustrate the influence of inappropriate exchange rates. The first situation is where the government, in order to keep down living costs in urban areas, allows the currency to be overvalued. Reserves of foreign exchange are used, along with overseas borrowing, to pay for increased levels of imports. All domestic production of tradable goods is in effect taxed. If agriculture is in a "traditional" phase, producing for a local market with little purchased inputs, it may be relatively unaffected by such a currency policy. In the market-oriented phase, by contrast, the overvalued currency will depress output prices of both export commodities and those that compete with imports. A number of estimates have now been made of the extent of this implicit tax on tradable agriculture, and the results indicate that the magnitude may be very considerable.

The second situation of exchange rate impacts on agriculture arises where the currency appreciates in value (against the major trading currencies) because of a sharp rise in export earnings. This has become known as "Dutch disease" after the impact on the Netherlands of the development of North Sea oil and gas deposits. It has been diagnosed in Indonesia, Nigeria, Venezuela and other developing countries with oil reserves. Governments often handle favorable developments as badly as unfavorable events. A flood of foreign exchange from a boost in export earnings from one sector can cause severe disruption in others. The exchange rate leads the way. Tradable good prices fall, cutting the cost of food imports and the profitability of exports. Labor leaves agriculture for the towns and the jobs created by the boom. Investment in farming is curtailed and policies to stimulate rural development are undermined by the country's good fortune. In this case, in contrast to the government-inspired overvaluation, there is a legitimate economic reason for the pressure on agriculture through the exchange rate. If the new inflow of foreign exchange were stable and long-lasting, and the proceeds used wisely, then the pressure on agriculture would signal the direction of long term resource deployment: if the inflow is temporary and the funds are squandered on consumption or unwise investment, then the disruption of the rest of the economy could have very severe consequences for living standards.

The exchange rate is not the only link between trade and monetary conditions and the conditions of the market oriented agricultural sector. Several other "macro-prices" are important. Inflation rates influence the cost of purchased inputs, and the government's reaction to inflation is often to peg those prices that it controls. Inflation should cause a depreciation of the exchange rate

(in so far as it outpaces inflation in trading partners), which would increase the price of agricultural (tradable) goods. But this gives the government the additional opportunity to "fight inflation" by keeping the currency overvalued. As agriculture develops more market linkages, it becomes more susceptible to this inflationary squeeze. Interest rates are also heavily controlled by governments, in an attempt to influence investment. Low official interest rates imply a capital rationing process, which often works to the disadvantage of agricultural sectors, and to the development of high cost informal credit systems in rural areas. In this respect, greater integration of agriculture with the non-farm economy may reduce some of the disadvantages suffered by the sector in attracting and investing capital.

Macroeconomic conditions also impact on agriculture through the level and growth of income. This linkage is also likely to increase over time. The process of development leads to a growing domestic market for agricultural produce to be filled by imports or home production. Economic growth stimulates agricultural development in the middle income nations, just as agricultural progress has proved to initiate general development in the lower-income countries. Where consumption growth is halted, for instance by the need to generate a trade surplus to meet debt obligations, agriculture slows down. By contrast, in the mature industrial economies, the influences of growth on agricultural demand tends to decline, as the share of income spent on foodstuffs becomes low.

In addition to the macro-economic conditions discussed above, other factors influence the agricultural sector to an increasing extent with the growing

market-orientation. One such factor is the level of protection on non-agricultural imports. Such protection has three effects on agriculture: it raises the price of imported inputs into the farming and processing sector; it lowers the purchasing power of incomes from agriculture; and it causes an appreciation of the exchange rate which acts as a tax on tradable goods, as explained above. Restriction of the availability of foreign exchange is often used in conjunction with tariffs and import quotas, each having similar effects. Available foreign exchange in such a system often goes to other more "modern" sectors of the economy. The acceptance of agriculture, and food processing, as legitimate growth sectors can minimize this effect, as can a move towards the removal of trade barriers in developing countries.

The combination of overvalued currencies, scarce foreign exchange, anti-inflationary price controls and capital rationing has often put agriculture at a severe disadvantage. Sector-specific policies often aimed at improvement of marketing have usually not been enough to offset these macroeconomic impacts. The increased market orientation of agriculture has highlighted these issues. Governments are taking steps to ameliorate the negative and emphasize the positive linkages. Much of their success lies in their own hands: an important part is influenced by conditions in the world agricultural markets. These too have undergone dramatic changes over the past fifteen years.

Implication of Increased Linkages among Agricultural

Sectors in the World Economy

As countries develop they typically make more use of international markets, both to export and to import. This seems to be true of agricultural trade as well as other types of goods. Imports of agricultural products now exceed

exports for developing countries as a whole, but several countries have had success in developing agricultural export markets. This expanded use of trade brings with it significant new problems for governments. Among the most important of these is the level and stability of world prices for agricultural products. This price level is itself a function of government policy decisions in the major trading countries. The high level of integration of domestic agriculture in the economy of industrial countries coupled with the phenomenon of global markets has turned once parochial issues of farm support into major international political and economic concerns.

This linkage of sectors and policies through world markets can be illustrated with a few examples. The cereals market situation has perhaps the most relevance for the majority of developing countries as well as being a key commodity in industrial country policy. Cereal trade expanded rapidly in the decade of the 1970s as a result of the process of growth and development, stimulated in particular years by harvest failures in certain importing countries. Government programs encouraged an expansion of investment in cereal production, and financial institutions stepped in with the necessary capital. Land prices soared as farmers, convinced that the future was assured, sought to expand their holdings. Trade volumes peaked in 1982, when world markets were hit by recession, debt problems and increased production in importing regions. Output continued to climb in the face of slack demand, leading to depressed prices, expensive bail-out measures, and high levels of stocks. The struggle for market shares led to further disregard for trading rules. The twin processes of domestic and international agricultural policy reform now underway is the direct result of the disarray in cereals and related markets.

Disharmony can spread rapidly between sectors and into other commercial areas. The case of cassava pellets from Thailand is a well-known example. In order to protect wheat producers, the EC increased the levies on corn in the early 1970s. This led German and Dutch feed compounders to substitute a mixture of soybean meal and cassava for the grain in animal rations. The Community negotiated a series of "voluntary" export quotas in 1982 with the major suppliers, of which Thailand was the largest. By this time, compounders had already begun to turn to corn gluten as the source of starch to balance the high protein oilseed meal. A ready supply was available from the corn wet milling industry as a by-product of the production of ethanol. Attempts by the EC to limit these imports provoked a heated reaction from the US.

Arousing even stronger US opposition has been attempts by the EC to tax vegetable oils within the Community in order to preserve the market for butter and prevent the further deterioration in the market for olive oil. The simmering trade war between the US and the EC nearly boiled, over the issue of Spanish accession to the Community which threatened a reduction in US grain sales into southern Europe. Japanese agricultural policies arouse almost as much hostility in the US as do EC policies. Even US-Canadian relations are put to the test on occasions, as when the Canadian courts found enough evidence of "dumping" to justify putting a countervailing duty on corn imports from the US.

The world markets for dairy and sugar are perhaps those where the influence of domestic farm support policies are the most pervasive--with rice and beef close

behind. With few exceptions, producers of these products face the artificial prices of government programs rather than the much lower world price. The market is made by the willingness of governments to pay export subsidies to remove their surplus stocks and output, and by the unwillingness of all but a few importers to open up the doors to these surpluses.

Policy Issues Arising from These Linkages

This uncertain trade environment poses particular problems for developing countries. The "new" agricultural policies, which emphasize producer incentives and a market orientation, come face-to-face with those of the industrial countries. Export possibilities are severely constrained by both the surplus production from exporting developed countries and by the protective policies of devalued importers. However the prospects for change in national policies seem at present to be better than for many years, though such developments are still not by any means assured. Countries are finding the combination of the budget cost at home and the displeasure of trading partners abroad is making the notion of reform politically acceptable. The Uruguay Round of GATT trade negotiations includes agriculture as a centerpiece, as governments attempt to coordinate their policy changes.

The changes fall under two headings, the decoupling of domestic income support from price incentives, and the recoupling of domestic prices with world prices. Decoupling is necessary to allow countries that have pressing political or economic reasons to transfer income to particular groups of producers to fulfill these obligations without imposing a cost on trading partners. Such notions face an uphill struggle. They typically involve bringing farm program

costs out into the open and placing the burden on the taxpayer. They also imply selective assistance to farmers, with the implication that such rights to income support have to be argued on merit whenever policies are under scrutiny. The politics of such decoupled policies is so different from that of the commodity-based price support schemes that the transition will not be smooth.

The case for recoupling with international markets is equally compelling. Countries will no doubt continue to manage domestic agricultural markets to some degree even if income support is removed as a major objective. If their domestic price levels can keep in touch with those on international markets, this market management will be made more easy and less costly. A policy of limited stabilization, though storage schemes, is often consistent with domestic and trade objectives. A fixed domestic price unrelated to movements abroad is both costly domestically and disruptive to world markets.

This twin goal might have seemed a year or two ago as the pipe-dream of academics out of touch with reality. Last summer both the EC and the US tabled suggestions for negotiations on agriculture in the Uruguay Round which laid out precisely such objectives. Though neither the US administration nor the EC Commission have entirely sold their proposals to their own domestic interests, the ideas will form the basis for negotiation.

Developing countries have an interest in the outcome of this process in at least two respects. First, any negotiated agreement on domestic price policies will alter, possibly dramatically, the world market for temperate zone agricultural products. Prices will tend to be higher and probably be more

stable if the agreement binds and reduces support levels. If there is no agreement, the chances are that the world market for many of these products will move towards one of managed trade, with agreed trade shares for the major exporters, and managed prices, to protect national budgets. In such an environment, developing countries will have less opportunity to emerge as exporters and lose much of their freedom as importers.

International discussions on global monetary arrangements will also have major impacts on developing countries. The largest industrial countries are exploring ways to implement the increased coordination of macroeconomic policies that will help to stabilize financial and foreign exchange markets. If these coordination policies work, then the task of developing countries will be made easier. Without an increase in stability the percent commitment to liberal trade and flexible exchange rates may evaporate. Under these conditions, developing countries may find themselves having to form closer alliances with individual industrial countries as a way of preserving at least some of the gains from trade.

Research Priorities

The research agenda suggested by the arguments in this paper is both broad and deep. At the level of disciplinary research, it is clear that we do not know enough about the behavior of complex political/economic systems, whether it be the international monetary system or the agricultural trade arena. Fundamental issues remain to be resolved before one can confidently point to the ways in which governments can improve the stability of these systems. One such issue is that of the relationship between stability and interdependence. One would

expect the establishment of global markets to impart stability to a system, when compared with separate regional or national markets. Shocks would be more widely dissipated. It is not clear that this has happened either in agriculture or in the general economic sphere. Is this an illusion, or does government behavior change in the presence of a global market, to take advantage of new opportunities for "exporting" instability? How does one measure the externalities inherent in such anti-social government policies? Can one internalize these externalities so as to prevent "misuse" of world markets? Or is instability just the price one pays for the income-enhancing effects of specialization and the benefits from global access to capital? Economists working in the area of international trade and monetary theory can contribute to our understanding of the new global markets and of the implications of greater economic intimacy among countries. Policy coordination issues bring into play the areas of systems analysis and decision theory.

In terms of subject matter research, there are a number of emerging issues with respect to the role of government policy in an open and unstable environment. Economists preach the virtues of exploiting comparative advantage: in practice that concept is not easy to pin down. It assumes a recognizable world price level to use as a yardstick and a reasonable idea as to domestic costs. Forecasts of world market prices, for a long enough period into the future to allow for investment decisions to bear fruit, require projections of exchange rate movements and national policies, as well as the more traditional supply and demand trends. Such calculations are difficult, even when basic information is available.

One line of research might focus on the set of problems facing governments when trade and monetary conditions change rapidly. What constitutes a "safe" trade policy for agriculture? How much risk is involved in pursuing an "open" policy for agriculture? Risk analysis in project appraisal is, of course, well established: risk analysis in trade and agricultural policy is less common. Models which include both domestic monetary variables and foreign trade conditions would be needed, and these in turn should be linked (formally or in an ad hoc way) with broader models of the macroeconomic environment and of world agricultural trade. Simulations of outcomes under certain sets of macroeconomic and trade conditions would lay the groundwork for agricultural policy choices in the new environment.

Such policy simulation exercises presuppose a body of information on the quantitative impact of current and past macroeconomic and trade policies. A major study conducted by the World Bank on the political economy of agricultural policies in developing countries will fill in some of the gaps in our knowledge. This study covered some 20 countries, and involved the calculation of income and output effects of agricultural policies over the past quarter-century—including the unintentional impacts of exchange rate disequilibria and commercial policy. The publication of this study is scheduled for later this year.

These policies studies tend to focus on the impact of government actions on national commodity markets. Another approach takes as the object of enquiry a farming system, or other microeconomic unit, and examines the effect of policies at that level. Private and social costs of inputs, factors, and

outputs are analyzed to give private and social profits. Conclusions are then drawn about the impact of various policies, including macroeconomic factors, on farm profits. Clearly, there is some cost to the extra detail: putting together the information from enough "representative" systems to be able to answer aggregate questions is costly and time consuming. But as a complement to the market-level studies, these analyses are proving to be of considerable value. USAID and the World Bank, together with some of the international agricultural research centers are pursuing this line of investigation. At some stage there will be a research pay-off to combining elements of farm-level and sector-level research in a policy model, just as there have been interesting attempts to combine agricultural sector analyses with broader computable general equilibrium models.

These models and types of analyses are aimed at improving decision-making in developing countries, though there is no reason why similar approaches should not be taken to changes in developed country policy. In that area the research priorities are somewhat different. Policymakers need assistance in two areas in particular. First is the question of the trade impacts of national policies. In this regard the major study by the OECD, which carefully measured the subsidy-equivalent of national policies and evaluated their trade impact, paved the way for the proposed policy changes. Other studies, such as those by Tyers and Anderson, USDA and IIASA, have added greatly to our knowledge on international transmission of policy effects. The task now is to refine these analytical studies to be able to answer the queries of policymakers on such basic issues as whether US cereal programs (including target prices and set-asides) actually increase or decrease production. Similarly, the output effect

of Canadian stabilization policies is also a matter of dispute. Framing rules for controlling the negative impacts of domestic policies would be easier if we knew more about the link between income support and commodity output.

The second agenda item is the need to develop domestic policy alternatives consistent with better trading rules. It is easier to talk about decoupled policies than to define them. Are "pure" transfer and stabilization policies possible? If not, how does one measure the degree of decoupling? Might decoupling involve more rather than less government intervention if output effects are to be eliminated? Are there other ways of negating or internalizing the external effects of national policies?

As the GATT round proceeds, these issues will be of interest to both developed and developing countries. The focus of the negotiations will be on framing rules within which domestic policy can operate. This will only be possible if countries can develop alternative policies to meet domestic objectives. Developing countries have a clear interest in the improvement of the performance of world agricultural markets, but they also will be affected by the trade rules in other ways. As actual or potential GATT members, developing countries will be under pressure to revise their own policies in the light of any agreed set of trading rules, unless blanket exceptions are granted. In the longer run the outcome of the GATT round may have as profound an impact on rural development as on the more obvious issue of industrial-country trade conflicts.

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Utility, Utilitarianism and Public Policy

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1. Introduction

The modern concept of utility makes its first appearance in the work of the mathematician D. Bernoulli (1738), where it is employed to "save" a particular decision rule from an embarrassment. The rule in question calls for choosing a gamble that maximizes expected monetary return. The embarrassment arises in connection with a particular gamble, which calls for a fair coin to be flipped repeatedly until heads comes up, and for the person who has purchased the gamble to receive $\$2^n$, where n is the number of the trial on which heads first occurs. It is easily shown that this gamble has infinite expected monetary return and thus should be purchased at any (finite) price at which it might be offered--no matter how large--contrary to anyone's intuitive understanding of what counts as a rational choice. Bernoulli suggested that the expectation rule could be salvaged by taking expectation with respect to the "value" of the monetary return rather than monetary return itself, and by assuming diminishing marginal utility for money.

The link thereby established, between the introduction of the concept of utility, taken as the measure of the value of something, and the salvaging of a simple "sum-ranking" rule for evaluating alternatives (namely, taking the sum of the probabilistically discounted utilities), prefigures the close connection one finds today between the technical concept of utility, as developed in the work of mathematically oriented economists and decision theorists, and various "sum-ranking" approaches to the evaluation of both personal choices and public policies. As it turns out, the modern theory of utility has been developed in a way that ensures that the value of any gamble is simply its expected utility. Moreover, the construction upon which this result is predicated lends itself to a natural

extension, by means of which one can defend a utilitarian sum-ranking approach to the evaluation of policies. Roughly speaking, by a careful definition of the functions of individual utility which define the components to which a social aggregation rule is to apply, one can not only hold on to a utilitarian-type sum-ranking rule, but defend it against a number of standard objections.

Stepping back and looking at this subject from a somewhat different historical perspective, utilitarianism came into prominence in the 18th and 19th centuries--particularly in England. As aggressively formulated by Bentham, it was perceived as a needed antidote to a variety of philosophical traditions which, it was alleged, merely served to rationalize various types of vested interest, by trapping them out in the guise of natural laws or eternal truths. To be sure, Bentham's attack on these vested interests, like the attack that Marxists would subsequently level, had the great disadvantage that it could be used against itself. Utilitarianism as presented by Bentham was subject to the objection that it, no less than the doctrines it was desined to replace, spoke to an interest (even if not yet vested), i.e., the interest of the greater number, the majority. Moreover, leaving the problem of ideology to one side, there is still a serious problem with Bentham's argument. What he argued was that utilitarianism is the only serious alternative to either falling into the anarchy of permitting everyone to judge the issues of public policy from the perspective of their own personal interests and/or moral commitments or falling into the despotism of supposing that the perspective (i.e., vested interests) of some one person or group of persons should be regulative for all. But this argument proceeds by way of a faulty disjunctive syllogism: if utilitarianism qualifies as an objective, impartial perspective, surely so must other normative positions as well.

Within the context of the intellectual development in the second third of the twentieth century, all of this became moot. In very general terms, the theory of knowledge that came into vogue, as expressed in the program of the logical positivists for example, rejected any claim to objectivity on behalf of any normative principle. Such principles, it was argued, cannot be objectively valid, since they are neither certifiable by reference to logic and meaning alone (cannot be shown to be true in any possible world), nor are they capable of empirical confirmation (cannot be shown to be true in this world). In fact, it was argued, such principles are not the bearers of truth values at all, but simply the objects of emotional commitment--a doctrine which, it will not escape the observant reader, provides an underpinning for an ideological critique much more sweeping than that envisioned by either the Benthamites--the philosophical radicals, as they were known--or subsequently by the Marxists.

But even if normative theories in general had not fallen into disrepute, utilitarianism still faced a serious problem concerning the intelligibility, or methodological propriety, of making the requisite interpersonal comparisons of utility. A principle that requires one to choose a policy maximizing the net sum of utilities as distributed to different individuals clearly presupposes that one can meaningfully compare the utilities associated with different persons in certain rather specific ways. Within economic theory, then, the trend during the same period--as expressed, for example, by Lionel Robbins (1932)--towards both an "ordinalist" interpretation of utility and scepticism with regard to interpersonal comparisons of utility, served to effectively block any proposal to use the classical version of utilitarianism as a fundamental norm for social policy.¹

Within the last few decades one can mark significant winds of change with regard to the methodological issues noted above. The theory of knowledge that is now in favor is not in principle so hostile to the suggestion that there might be an objective (or rational) approach to policy evaluation, and for many the problem of interpersonal comparisons of utility no longer appears so intractable. As one might expect, then, the last few decades have witnessed a considerable revival of interest in a utilitarian approach to policy evaluation.²

That revival has been encouraged in no small part by the work of a number of economists and decision theorists. What one finds in surveying the more formal literature is a variety of distinct ways to underpin utilitarianism as a fundamental perspective on social policy. Some of the arguments proceed axiomatically by way of establishing conditions on what is to count as an adequate social welfare function, and in each case, in effect, the suggestion is that the set of axioms that serve to establish the expected utility theorem for individual choice can be plausibly extended and transformed so as to apply to the case of social choice. Alternatively, one can try to make the perspective of individual choice even more foundational, and argue that utilitarianism is just the principle to which a rational, self-interested person should be committed, given that he must make a choice between principles under conditions of substantial uncertainty as to his own position and prospects in society.

Moreover, these arguments (unlike the one put forward by D. Bernoulli with regard to gambling) usually do not simply beg the question in favor of a simple sum-ranking rule.³ The power of these contemporary constructions, it would appear, resides precisely in the consideration that they start at least some distance from such a presupposition. To be sure, the point of these exercises is to provide a formal reconstruction of a simple sum-ranking principle, and one which is antecedently taken by many to constitute the most appropriate way to approach both

individual decision making and the evaluation of alternative public policies. But sum-ranking comes in as a theorem, rather than as an axiomatic presupposition.

Despite these interesting developments, there are still substantial issues that arise in connection with utilitarianism. As my opening remarks were designed to suggest, there are questions that can be raised in particular about the sum-ranking feature of the utilitarian principle: the presupposition that one collection of individual utilities is at least as good as another if and only if it has at least as large a sum total. In particular, many have questioned this feature on the grounds that it yields an approach to public policy that is not sufficiently sensitive to issues of (economic) deprivation and, more generally, inequality. At a somewhat deeper level yet, one can even ask whether utilitarianism qualifies as a basic normative principle at all, or whether, to the contrary, it is best understood as a purely subordinate principle, applying to only a very restricted set of policy issues.

My objectives here, then, are two-fold: (1) to trace out these recent developments--developments which could be said to provide encouragement to those who are interested in defending a utilitarian perspective, and (2) to offer some thoughts about why these constructive implications should be resisted (and hence why the constructions in question should be viewed more cautiously).

2. Utilitarianism as a Theorem

It is now generally recognized that the strikingly negative results that Arrow generated concerning the possibility of rational social welfare functions are conditioned by the assumption, implicit in his formulation of the independence of irrelevant alternatives postulate, that the preferences of individuals are representable by scales that are essentially ordinal and interpersonally non-comparable. Within the balance of the framework adopted by Arrow, and with an explicit allowance for various kinds of interpersonal comparability, positive results can be recovered.⁴

The theorems in question all presuppose that the task is to find a social welfare function W which will specify a social ordering over a set $X = \{x, y, \dots\}$ of social alternatives for any given n -tuple of real-valued "personal" welfare functions $W_i(x)$, each defined also over X , for each person i in the "society" under consideration.⁵ Against this background, various comparability conditions can then be introduced. To take a relatively strong condition first, if welfare levels for different persons are cardinally fully comparable--i.e., not only

can ratios of differences be compared, but levels themselves can be (ordinally) compared--a version of a utilitarian social welfare function can be recovered (as well as certain other social welfare functions). More specifically, the rule that orders social states by reference to the sum of the $W_i(x)$'s satisfies the following set of conditions:

- (1) Arrow's Unrestricted Domain,
- (2) Independence of Irrelevant Alternatives (reformulated for this sort of framework),
- (3) Strong Pareto Principle,
- (4) Anonymity (a considerably strengthened form of Arrow's Non-Dictatorship),
- (5) Cardinal Full Comparability.

Moreover, if Cardinal Full Comparability is weakened to:

- (5') Unit Comparability (i.e., ratios of differences can be compared, but not levels),

then the utilitarian sum-ranking rule is the uniquely acceptable rule. Alternatively, conditions (1) through (5), taken together with:

- (6) Separability, and
- (7) Continuity,

once again imply that the simple utilitarian sum-ranking rule is uniquely acceptable. Separability here means, roughly speaking, that given two distributions x and y , such that $w_i(x) = w_i(y)$, for some i , the social ordering of those distributions should be the same as the social ordering of x' and y' , where $w_j(x) = w_j(x')$, and $w_j(y) = w_j(y')$, for all j except i , and $w_i(x') = w_i(y') = w_i(x) + a$. The sense of continuity here is just the usual one that suffices to ensure that W can be represented as a real-valued function.

It is interesting to note, moreover, that all of these constructive results with regard to utilitarianism presuppose an separability assumption: in the case of results that turn on the assumption of restricted comparability--Unit Comparability--the requisite separability turns out to be captured in the

comparability condition itself--which permits the measure of welfare (W_i) for a given person to be subjected to the addition or subtraction of a constant without changing the social ordering. Another distinctive feature of these theorems, moreover, is that they make no presupposition regarding the nature of the W_i 's--except, in each case, the respects in which they are comparable.

By way of contrast, there is an important pair of utilitarian theorems due to Harsanyi (1953 and 1955), which turn on a considerably more restrictive assumption as to the nature of each W_i , namely that it satisfies the conditions of the Bayesian theory of utility (i.e., some version or other of the expected-utility theory). On the first of Harsanyi's arguments, which can be characterized as his axiomatic social welfare argument, Utilitarianism "almost" follows from three very simple and plausible axioms:

- (1) individual preferences satisfy the Bayesian Axioms for utility theory;
- (2) social preferences satisfy the same axioms;
- (3) if all individuals are personally indifferent between two social options, then the social preference treats those two options indifferently.

What follows, in fact, from these three axioms is that the social welfare function must be a linear combination of individual utilities. In the presence, however, of the following additional assumption:

- (4) The linear social welfare function implied by (1) - (3) is symmetric with respect to individual utilities, i.e., it treats different individuals equally,

utilitarianism emerges once again as the uniquely acceptable social welfare function. Harsanyi himself has parsed the Bayesian axioms in a variety of ways, but, leaving to one side certain technical and/or structural assumptions and definitions, they essentially reduce to three: (i) weak ordering; (ii) continuity; and (iii) separability (e.g., Samuelson's strong independence axiom or Savage's "sure-thing" principle).⁶

The other of the arguments offered by Harsanyi, which can be termed his uncertainty choice argument, turns on supposing that the representative individual must choose between various social alternatives under conditions of radical uncertainty as to which position he will end up occupying. More specifically, once again

a social state x can be characterized for evaluative purposes in terms of an n -tuple $\{w_i\}$, $i = 1, 2, \dots, n$, of individual values, representing the utilities or welfare to be derived by each of n individuals from x . As the problem is formally defined, radical uncertainty is spelled out in terms of the principle of insufficient reason: in the absence of any information it is reasonable for the agent to proceed on the assumption that he is just as likely to end up being any particular person i as any other. If the person's personal preferences with respect to these options are presumed to satisfy the Bayesian axioms, then he must end up choosing so as to maximize expected utility; and, since in this case the probability weights over the n different possibilities will all be equal, this is equivalent to supposing that he will choose that state x for which the sum of the component values, $\sum w_i$, is maximum.

Stepping back and reflecting on these constructions, it can be noted that they are all connected, in one way or another, with the Bayesian construction itself. The connection in the case of Harsanyi's uncertainty argument is obvious--indeed, what that argument essentially does is to convert the social choice problem into a problem of individual decision making under radical uncertainty, but the connection is there to be marked in the other cases as well. In the first three theorems reported above, the Anonymity condition functions analogously to the way that the Symmetry condition functions in Harsanyi's social choice argument, and analogously to the way his assumption that one is just as likely to end up being any particular person as any other functions in his uncertainty choice argument. But each of these assumptions amounts, in turn, to a more specific analogue of an a principle which is central to the Bayesian construction, namely, that the decision-maker must be able to assign well-defined probabilities to all conditioning events. Moreover, all of the constructions mentioned above explicitly or implicitly impose an ordering assumption, a separability assumption, and (in all but one case) a continuity assumption. What one has, in fact, is simply a series of variations on a fundamental theorem to be found in Blackwell and Girschick (1954), and many other basic texts, concerning a set of conditions sufficient for the ordering of an n -dimensional vector space.

3. *Utilitarianism, Deprivation and Equality*

Despite these rather striking formal results, one still finds as a persistent objection to Utilitarianism that it is insensitive in principle to two distinct (albeit connected issues): the problem of deprivation, i.e., the welfare of the least well-off, and, more generally, the dispersion or distribution of levels of welfare, i.e., the problem of inequality. On the surface, both of these problems appear to

arise in virtue of the sum-ranking feature of utilitarianism: it seems quite possible that severe deprivation on the part of some can be offset by the affluence of others; and averaging concepts simply abstract altogether from considerations of dispersion. Notice that these two objections to utilitarianism have nothing to do with the question whether interpersonal comparisons are possible: indeed, arguments to the effect that utilitarianism neglects such matters as deprivation and dispersion presuppose some form or other of interpersonal comparison. More particularly, dispersion measurements require at the very least unit cardinal comparability, and a fully satisfactory treatment of deprivation would seem to call for the much more demanding condition of a ratio scale representation.⁷

The utilitarian, of course, has a response. He will insist that there is place, within a utilitarian framework for concern about deprivation and inequality, but also insist that insofar as this concern is based on "intelligible" considerations, there is no need to give (special) weight to these concerns at the level of the evaluation of distributions of individual utilities (or welfare). The argument is that income distributions that do not leave some seriously deprived, and/or that are more equitable, can be expected to result in a greater *sum* of utilities. (Similar considerations can be adduced, moreover, with regard to any other good to be distributed. In what follows, then, I will speak in terms of income, meaning thereby merely to take it as representative of a class of goods whose distribution is the object of social concern.)

Stories that are "intelligible" from the perspective of the utilitarian theorist appear to come down to variations on one or the other of the following three themes:

- (1) accounts that trace out certain implications of the so-called law of diminishing marginal utility;
- (2) stories that take the utilities of a given person as reflecting not only his preferences with regard to the level of income he is to receive, but also his preferences with regard to the shape of the whole distribution (e.g., he may well experience "unpleasantness" at the thought of a significantly unequal distribution)--or, alternatively, that suppose that the social planner may incorporate his own concerns about income deprivation and inequality into the individual utility (or welfare) components which are then to be summed together; and
- (3) accounts that focus on the consideration that a markedly inegalitarian scheme may create an incentive problem that will impact adversely on the expectations of all.

Looking back at the history of the debate over utilitarianism, one finds early and repeated appeal to the principle of diminishing marginal utility for income as a device for squaring utilitarianism with intuitions about the importance of equality. In the presence of the assumption of diminishing marginal utility, and certain other assumptions, utilitarianism will end up ranking more egalitarian distributions of income over less egalitarian ones.⁸ Indeed, it has been suggested that the ordinalist revolution, with its explicit rejection of utilitarianism, was fueled in part by what many took to be the excessively egalitarian implications of that principle.⁹

Similar conclusions hold in so far as it can be assumed that members of society have other than purely non-tuistic concerns--that they care, at least to some degree about how much income others get. Given that the utility values which utilitarianism aggregates register such concerns (i.e., preferences), this will once again lead to the favoring of more rather than less egalitarian distributions.

Taken together these first two stories serve, it would seem, as an effective reminder that utilitarianism need not be hostile to the problems of deprivation and inequality. However, they also serve to illustrate that a sum-ranking rule for social choice can be rendered more plausible (saved) by supposing that it aggregates utilities that already encode (in one way or another) information about deprivation and dispersion that is relevant to the evaluation of alternative distribution schemes.

4. The Issue of Incentives

As is well known, of course, the argument from incentives cuts both ways. While the need to provide effective incentives may require limiting to some extent the dispersion of the distribution of income, incentive considerations can also be introduced to defend a significant degree of income inequality. I propose here to bracket this type of argument. What distinguishes it from the other two types of argument is that it purports to speak to considerations that have an impact (within a dynamic context) on the sum total of income available--and, thus, on what sets of income distributions will even qualify as feasible. By way of contrast, the other two stories focus on the question of how, given a fixed set of distributions of income, those distributions are to be evaluated from a social (and perhaps also an individual) perspective. My own view is that what is really lacking in contemporary discussions of social welfare is a well-articulated and grounded theory of incentive effects, and that such a theory is indispensable to any plausible normative social perspective, utilitarian or otherwise. But it is also my sense that a full appreciation and understanding of

the problem of incentives will not serve to settle any issue between utilitarians and other, non-utilitarian, social theorists.¹⁰

5. *Utilitarianism and the Problem of Deprivation*

The brief summary above suggests that there are two distinct concerns that utilitarians have tried to show can be incorporated into their perspective, namely, sensitivity to the issue of deprivation, i.e., the assignment to some of extremely low levels of income, and, second, sensitivity to the more general issue of equality. It will prove useful, I think, in surveying the utilitarian response in more detail, to deal with these two concerns separately.

With regard to the problem of registering concern for deprivation, it is clear that the significance (from a social perspective) of low levels of income or other goods can be encoded in the welfare value assigned to a given level of income, and that such encoding will normally be fully appropriate. That is, if amount of income does not adequately express what is important from a social perspective, then it is appropriate to think of evaluation as concerned with distributions over something like "welfare values" (e.g., the W_i 's discussed above in Section 2), rather than incomes. If individual welfare W_i is a strictly concave function of income distributed to the i -th person, one can be assured (at least in the presence of certain other assumptions) that redistributions of money from those who have more to those who have less will raise "aggregate" social welfare--even when aggregation proceeds by reference to the simple sum-ranking rule.

In the presence of some specific theory about the relation between income levels--including a specification as to how welfare is to be measured--a sum-ranking utilitarian approach to the aggregation problem could be said to leave room for sensitivity to deprivation with respect to income. But, of course, what accounts for that sensitivity is not the sum-ranking rule itself, but the fact that it is now taken over the W_i 's rather than income levels. That is, sensitivity to deprivation is strictly a matter of the functional relation postulated between W_i and income distributed to the i -th person, and that is presumably something to be determined by appeal to considerations exogenous to the specification of the form of the aggregation function itself.

Notice, moreover, that this approach does not saddle the social welfare theorist with a requirement that the aggregation rule be sensitive to dispersion (as distinct from deprivation) issues--either with respect to income or welfare distributions.

Indeed, it is possible to take the position that once the issue of deprivation has been resolved, economic egalitarianism is of questionable value. And one might be inclined to this view even if one did not think that egalitarianism created incentive problems. More to the point, from this perspective the question of whether relative dispersion of incomes is relevant or not to social welfare is simply an open question.¹¹ This is true, in principle, even for the utilitarian theorist--that is, it is still open to him to think of the W_i 's themselves as encoding more than information about deprivation with respect to income, i.e., information about other features of the dispersion of income.

To be sure, if the rule adopted for the aggregation of the W_i 's is the sum-ranking utilitarian principle, then sensitivity to any features other than the mean of the distribution of welfare levels (as distinct from income levels) is precluded. Moreover, if the W_i 's are taken as functions just of amount of income distributed to the i -th person, without regard to other features of the distribution, and if the rule employed to aggregate the W_i 's is the sum-ranking rule, then concern for any other features of the distribution of incomes is also ruled out.

In this regard, there is an illuminating parallel that can be drawn to the case of individual choice. Suppose that utility were measurable by some other means than testing the agent's reaction to various gambles--e.g., by appeal to a measurement device predicated on being able to operationally determine "just noticeable differences" in value or utility. To insist in such a case that the expectation rule held with respect to gambles over prizes that had been scaled in this alternative manner, would be to assume that the agent is completely risk neutral with respect to gambles. Such a hypothesis is not only empirically false, but, more to the point, highly questionable from a normative perspective. One might hope to be able to exact a similar concession from the utilitarian with respect to social choice. That is, if the levels of individual welfare over which any social aggregation operates can be independently measured, it would surely be an open question whether maximizing the aggregate sum of those welfare values is the most appropriate social policy.¹²

More generally, however, when the issue of sensitivity to deprivation is treated in this fashion, with only a handwave in the direction of the notion that each W_i can be taken to be a strictly concave function of income, the conclusion seems inescapable that utilitarianism has now become simply a formal schematism--and an artifact of a representation theorem--rather than a substantive principle for deciding matters of public policy. So interpreted, the utilitarian theorem also serves to highlight what I have characterized as the legacy from D. Bernoulli--the idea that a simple sum-ranking rule for ordering gambles can be salvaged by introducing a function that transforms

income amount into utility, and then aggregates with respect to these values.

Moreover, the clue as to when one has crossed over the line from a genuine concern (from a substantive utilitarian perspective) with issues of deprivation to a purely formalist technique for recovering utilitarianism as a schematism or as part of a representation theorem, is clear enough. Those who are really concerned with deprivation will demand a version of utilitarianism that aggregates with respect to W_i 's that have ratio scale (as distinct from interval scale) properties. But despite the fact that a number of the representation theorems presented in Section 2 above would have to be substantially revised if the W_i 's were measured on a ratio scale, the possibility of ratio scale representations has received little attention.¹³

6. Utilitarianism and Equality

The modern tendency to rest content with utilitarianism as a schematism, or as the product of a representation theorem, emerges even more clearly if one turns to consider the other major problem that has preoccupied those who would defend utilitarianism against its detractors, namely, the issue of equality. To the charge that utilitarianism shows no sensitivity to the issue of equality--that it cares only for maximizing the sum total of utility, not how it is distributed among persons--the advocate of the modern axiomatic approach to utilitarianism will respond that nothing in his approach precludes taking equality of income distributions into account. Thus consider, for example, the "Mirrleesian" approach to registering the dispersion features of income distributions.¹⁴ This involves taking social welfare to be an additive function of some particular concave transformation of each individual's utilities--the same function for all individuals--where the individual utilities are, presumably, already concave on income.¹⁵ As Sen (1973, p. 39) notes, the "Mirrleesian" approach rules out the somewhat more direct additive formula of utilitarianism. But separability is satisfied, and the sum ranking rule is recovered at another level. That is, individual components of social welfare continue to be judged without reference to the welfare components of others, and the social welfare components corresponding to different persons are eventually simply added up to arrive at the social welfare value. As one might expect, what this means is that more equal distributions not only of income, but now of individual utility (or welfare) can be accorded a greater social value, even while one stays in a (modified) utilitarian framework.

To be sure, it might seem in a separable framework of this

type, where individual components of welfare are judged without reference to the welfare components of others, that dispersion considerations are being factored out. The answer is that they are, of course, factored out (and this by definition) at the level of the aggregation of separable components of social welfare; but they need not be factored out if one looks at the problem from the perspective of individual utility (or welfare) for income (and hence, of the income level itself). The notion is that one can find a transformation function for utilities of income such that (1) viewed from the perspective of a distribution of these transformed functions, the aggregate value of the distribution is the simple sum of these welfare values, while (2) viewed from the perspective of its being (at a deeper level yet) a distribution of individual utility values (and even deeper yet a distribution of income), the aggregate social value is not a simple function of the average level of utilities (or income) but, in effect, takes into account dispersion characteristics of the utility (or income) distribution as well.

It is important to notice, however, that what is being invoked here is once again nothing more than a schematism. We are being told that to the degree that we want to incorporate egalitarian considerations into the social welfare function, this can be accomplished without having to give up a simple sum-ranking approach to aggregation. In particular, and most revealingly, nothing has been said concerning just how much weight is to be given to dispersion considerations, and how dispersion itself is to be measured.

The parallel here to modern utility theory for individual decision making is striking. The latter theory allegedly places no restrictions on how risk averse one wants to be about gambles over, say, monetary amounts, that is, how concerned one wants to be about the dispersion characteristics of the probability distribution over these monetary amounts. As the story is usually told, such risk aversion simply determines the degree of concavity of the agent's utility function for money. That is a matter about which the individual, then, must decide for himself: the task of the decision theorist is simply to remind the agent that once he has settled that question, a rational approach to choice consists in applying the standard expectation rule, not to monetary amounts, but to these risk-reflecting "utilities" for money. In a similar fashion, the modern utilitarian theory leaves it up to "us" to decide how much attention "we" want to pay to egalitarian (dispersion) considerations. And once "we" have decided this, its recommendation is simply that policy should be chosen so as to maximize a simple sum, taken with respect to "utilities" that encode "our" attitudes toward equality with respect to income distributions.

There is also a parallel here to the way in which the so-called fundamental theorems of welfare economics are usually interpreted. The first theorem establishes that under a certain

set of conditions a perfectly competitive market system will satisfy the condition of pareto-optimality, and the second theorem establishes that however one wants to settle the issue of an appropriate distribution of benefits at the level of optimal output, a perfectly competitive market can achieve that distributive ideal, so long as one makes the requisite lump-sum transfers at the outset. The model itself, however, makes no attempt to settle the issue as to what counts as the appropriate distribution of benefits, or how dispersion is to be measured: these are matters the determination of which is exogenous to the model.

Returning to the "Mirrleesian" construction, there is, it should be noted, one other drawback with this approach. One cannot read off from the implied social welfare function whether it incorporates concern for inequality, or simply concern for deprivation, i.e., low income levels--since both are expressed by introducing some strictly concave function of income. And, once again, the parallel to utility theory is striking: there is a systematic ambiguity with respect to whether the shape of a person's utility function for money reflects, say, the diminishing (or increasing) importance of increasing amounts of money, or his attitude towards risk itself.

7. Utilitarianism and the Measure of Equality

On the approach described above, dispersion is allegedly, if only implicitly, taken into account by the introduction of strictly concave functions of income levels--but no particular rule for measuring dispersion is thereby implied. But, of course, dispersion of income distributions (or, for that matter, welfare distributions) can be measured in some fashion or other, and then explicitly incorporated as a parameter in the social welfare function. In this case, it will be possible to infer something about the formal properties of the social welfare function, given the particular method used to measure dispersion.

In particular, depending on the way in which dispersion features of the distribution enter into the evaluation, it may or may not be possible to represent such evaluation as if it consisted in the application of a simple sum-ranking principle (defined at some level or other). To be more specific, if the measure that is used is linear on incomes--e.g., the Gini coefficient, or average deviation from the mean--then it will not be possible to represent evaluation as proceeding in terms of the maximization of the sum of some strictly concave function of income (or if the linear measure is applied to the dispersion of utilities of incomes, then in terms of some strictly concave function of individual utilities). This also means that the implied social welfare function will fail to be separable. In

short, within this sort of framework, the summation rule will fail to hold not only with respect to income levels (or individual utilities), but even with respect to any uniform transformation of such components of the income distribution.¹⁶

If, on the other hand, dispersion is measured in terms of, say, variance, then by adapting a familiar theorem from utility theory one can represent the evaluation in terms of the maximization of the sum of a strictly concave function (of income (or, again, the utility of income)).¹⁷ In this case, the implied social welfare function can satisfy the condition of being separable--and simple additivity will hold at the level of some transformation of the components of the income distribution. By this means, then, dispersion characteristics can be explicitly measured and incorporated into the evaluation of income distributions, and evaluation by simple summation will be saved--at least at the level of aggregating utilities of income. Note, however, once again adapting a familiar result from utility theory, that the implied strictly concave function over income (or individual utility) will be quadratic in form. But this, in turn, implies that it will be possible to construct income distributions that are strictly dominated by other distributions, but have a higher welfare value.¹⁸ On the whole, then, this does not seem like a promising way to save a sum-ranking rule.

What emerges from these reflections is that the presupposition of separability turns out to be very restrictive in this sort of context. Separability with respect to the component W_i 's severely restricts taking the dispersion of the W_i 's into account. Moreover, if separability holds at the level of individual utility components of social welfare, i.e., with respect to components defined in terms of either a utility or welfare function over income, and if this function is the same for all persons, then separability will also hold at the underlying level of income distributions. Thus, however dispersion is taken into account at the level of income distributions, it will have to be measured in a way that satisfies separability. This, I take it, is straightforward. By hypothesis, distributions of individual utilities or welfare must satisfy separability. Recall that this means, roughly speaking, that if one income distribution is ranked over another, where some one individual receives the same utility or welfare under each distribution, then modified versions of those two distributions, in which that same person still receives the same utility or welfare regardless of which distribution he participates in, but at a lower or higher level, must be ranked in the same fashion. But if some individual receives the same utility or welfare under two different distributions, then he must also receive the same income under those two distributions. Turning this around, separability of W with respect to the W_i 's will be violated if dispersion of income is measured and registered in a fashion that does not leave the ordering of income distributions invariant for certain proportional changes

in income levels for a given individual.

8. Utilitarianism and Attitudes Towards Equality

Factoring in dispersion considerations by introducing strictly concave functions of income (or individual utility) presupposes that there is some fixed set of income levels (or levels of utilities) over which the strictly concave function is defined. Could one realize a separable social welfare function that still takes dispersion into consideration by proceeding in a somewhat more localized or piecemeal fashion, by supposing, for example, that relative to any particular income distribution the social value of the income distributed to a given person is not just a function of the amount of income he gets, but also of the dispersion properties of the distribution as a whole? There would seem to be two different ways to accomplish this.

One might suppose that the individual himself evaluates what he gets in the light of characteristics of the distribution as a whole--in which case the arguments of the social welfare function themselves can be taken to encode distributional considerations in the value associated with the income assigned to the i -th person. On this account the social welfare function would aggregate not individual personal preferences, but what could be termed individual social preferences. Within this sort of framework, of course, one could easily argue for separability, and even more specifically, for a simple and direct sum-ranking social welfare function. After all, distributional considerations have now been firmly given their place, in the attitudes of the members of the community, and so a simple summation rule might well make sense.¹⁹

Notice, moreover, that within this framework, separability could presumably hold with respect to distributions of "individual" values (i.e., the social value the i -th person attributes to getting a certain level of income within the context of a particular distribution of income), but fail to hold at the level of distributions of income (or personal utilities for income). This could happen because in this sort of framework there is no unique function from any given income level to utility--the same function for all persons. If distribution x assigns person i an income of x_i , and distribution y assigns him y_i , where $x_i = y_i$, it may well be, in virtue of dispersion differences between the total distributions, that $w_i(x)$ does not equal $w_i(y)$. And adding a constant amount of additional income to the i -th person may not result in proportional changes in $w_i(x)$ and $w_i(y)$. One could still insist, however, on separability with respect to the w_i 's: that given two distributions x and y , such that $w_i(x) = w_i(y)$, for some i , the social ordering of those distributions should be the same as the

social ordering of x' and y' , where $w_j(x) = w_j(x')$, and $w_j(y) = w_j(y')$, for all j except i , and $w_i(x') = w_i(y') = w_i(x) + a$.

Such an approach does raise an interesting issue of circularity, however. Suppose that individual preferences do express among other things social concerns, and that these concerns are taken as something that should be captured as part of the input to a social welfare function. One would suppose that a thoughtful person would want to reserve judgment about his own social concerns until he learned the outcome of the social evaluation process--but of course he cannot do this because the very object of the social evaluation is not even well defined until he has registered his own input--in the form of his own distributional preferences, etc.

Alternatively, one could take the arguments of the social welfare function to be characterized in neutral terms, i.e., as profiles of individual (non-tuistic) utilities, but treat the social welfare function itself as operating as if it took distributional considerations into account. In this case, one could suppose that the social welfare function takes as arguments distributions of income (or distributions of individual utilities) but that the aggregation function works in the following way: the aforementioned distributions (of income or individual utilities) are first subjected to a transformation expressive of social concern for dispersion aspects, and then the resultant component values are aggregated in some fashion or other. And, of course, once again aggregation could be in terms of a simple sum-ranking rule.

This approach would differ from the "Mirrleesian" one discussed previously, in which income (or individual utility) is subjected to a strictly concave transformation. The difference is that in the previous case, it was presumed that all incomes (or utilities thereof) were subject to the same strictly concave transformation. In the present case, the transformation functions would have to be understood as relativized or localized. Each income level (or utility value) within the distribution associated with a given social option would be subjected to a transformation that encodes the concern of, say, the social planner with the dispersion characteristics of that distribution.

Of course, in the absence once again of any explicit account as to how dispersion is to be measured, and how much it is to count, this sort of approach provides once again nothing more than a schematism. In particular, it has no real content, except (ironically) for its being, once again, somewhat restrictive in regard to what could count as a method of measuring dispersion. In this respect this approach would suffer from many of the defects raised above in connection with schematisms that presuppose a single, uniform strictly concave transformation of all income (or utility) values.²⁰

9. What Mandates the Sum-Ranking Approach of Utilitarianism?

Here, then, are a variety of approaches to factoring in heightened concern for either low levels of income or, more generally, dispersion. As I have tried to suggest, however, one trouble with many of these proposals is simply that the crucial problems are not addressed: how to measure deprivation and dispersion, and how much weight is to be accorded to these factors in assessing social welfare. One is bound to wonder, I must confess, whether neglect of these matters does not signal that the axiomatically oriented utilitarian theorist is really determined to throw to those who worry about such matters no more than a purely formal bone.²¹

The utilitarian theorist can insist, of course, that his sum-ranking approach nonetheless does emerge as an important representation theorem. But what does this mean? It is certainly true that if the component U_i 's or W_i 's and/or the social ordering W satisfy certain conditions, W will be separable with respect (to some representation or other of) its components. And, *qua* representation theorem, the crucial issue will simply be whether the conditions in question can be presupposed to hold over some domain or other. But if this construction is to have any normative punch to it, one must, in addition, show that the conditions in question are bound up with, or implied in some fashion or other by, an explicitly normative conception of rational choice. Since, in particular, there is a considerable amount of evidence to the effect that individuals do not as a matter of fact order alternatives (social or individual) in a manner that satisfied the separability axiom, nor in a manner that satisfies the unusual continuity axiom, what is requisite is that some argument be offered as to why a rational agent must accept these axioms as normative for choice.²²

Discussion of this matter is crucial, for as I have argued above, these axiomatic presuppositions (of separability and continuity), which are central to the utilitarian way of thinking, are highly restrictive, and to that extent questionable. Dispersion considerations can be explicitly and precisely introduced in ways that will not generate a social welfare function satisfying either one or the other (or both) of these conditions, and hence a function that is neither separable nor additive on any transformation of the components of the income distribution. In this respect, the requirement that the social welfare function be separable on the component utilities of income restricts the manner in which dispersion can be measured and evaluated.²³ And continuity, similarly, rules out any rule that gives lexicographical priority to certain considerations.

Why, then, the long-standing commitment to these conditions as normative for choice? Concerning separability, among those

who have been drawn to axiomatic approaches to utility theory and utilitarianism, part of the answer is to be found, I think, in an unfortunate confusion with regard to the axiomatic formulation of this condition. As presented by Harsanyi and many others, separability is guaranteed by appeal to a dominance condition. There is no question, of course, that one can formulate a dominance condition that does secure the requisite condition of separability. But Harsanyi and others have tended to gloss their axiomatic constructions in a manner that can lead the casual reader to confuse a highly intuitive simple dominance condition (dominance with respect "sure" outcomes) with a much stronger, and by no means so intuitively secure, extended dominance condition. It is the extended dominance condition, however, that is required for the constructions in question.

Here, for example, is how Harsanyi explicates the dominance principle:

Other things being equal, a rational individual will not prefer a lottery yielding less desirable prizes over a lottery yielding more desirable prizes.²⁴

Now, Harsanyi insists that this principle is very compelling. And certainly, as it is usually understood, it is intuitively very secure: indeed, if one understands by "prizes" something like "sure outcomes," that is, monetary awards, or other sorts of goods, then the principle could be said to speak to nothing more than the very concept of what it means to maximize. Unfortunately, for the theorem to go through, one needs to invoke the principle in a considerably extended form: the principle must also hold for lotteries over lotteries. And given that much more general formulation, it is simply not at all so compelling.

Daniel Ellsberg diagnosed the problem here some twenty-five years ago, offering a version of the following counter-example.²⁵ Suppose you are offered a choice between a well-defined lottery (G1) in which one stands to receive \$100 with probability .5, and \$0 with probability .5, and two gambles (G2, G3) based on binary "black-box" mechanism, which has the same schedule of prizes, but where the odds are completely unknown to you, i.e., in G2 one faces a completely uncertain prospect (UP) of getting \$100 if, say, state 1 occurs, and \$0, if state 0 occurs; and in G3 one gets \$100, if state 0 occurs, and \$0, if state 1 occurs. Many people declare that they would strictly prefer the gamble with known odds to either of the uncertain prospects. By reference to the dominance principle in its extended form, one would then have to strictly prefer the well-defined lottery, $L = (G1, .5; G1, .5)$ = G1 to the following lottery, $L^* = (G2, .5; G3, .5)$. But L^* is clearly equivalent, in terms of possible outcomes and probabilities to L: for it also promises one \$100 with probability .5 and \$0 with probability .5. That is, by

conditioning symmetric uncertain prospects on events whose probabilities are well defined and symmetrical, one cancels out the uncertainties. Something must give here, then, and I suggest that the natural candidate is the extended dominance principle.

The above line of reasoning undercuts the appeal of the separability condition as a condition on individual preference--at least in so far as separability is conceived to depend upon the extended dominance condition. But once separability is thereby disconnected from a secure dominance condition (i.e., dominance with respect to "sure" outcomes), its status, it seems to me, becomes a much more open question. Note, however, that even if one finds the separability condition for individual choice plausible, objections can still be raised to it as a condition on social preference. This is important, because even if one discounts the objections of Ellsberg and others to separability as a condition on individual choice, Harsanyi's social choice argument and the other utilitarian theorems discussed in Section 2 all invoke some sort of separability condition for the social ordering as well.²⁶

Finally, whatever intuitive appeal one may still think the extended dominance condition has (and hence the separability condition it implies), the continuity axiom that figures so prominently in many of these constructions is even harder to defend as a normative condition. Within the context of a representation theorem, what this condition secures is, of course, that the individual (or social) welfare function is real-valued. This makes for a much more economical representation, for computational ease, and is, of course, indispensable if one is to employ some of the classic mathematical techniques for finding maxima, etc. Moreover, many economists seem to be quite conceptually disposed to the idea that a rational person will always be willing to trade off one consideration in favor of another, if the rate of exchange is sufficiently favorable. But once again, leaving habits of mind and/or intuitions to one side, it is not at all clear why one should take such a condition as *normative* for either the social or individual orderings.²⁷

10. Utilitarianism and Uncertainty

From the perspective of the questions raised above, there is also little to be gained by shifting to Harsanyi's other argument--the argument from uncertainty. To be sure, this approach gets around any objections that can be raised to invoking separability with respect to the social ordering: the argument goes through simply on the assumption that the individual's personal preferences are subject to the Bayesian axioms. But this line of reasoning is not insulated in any way from the objections that can be raised once again to the

separability axiom, and for that matter the continuity axiom, both of which are central to the Bayesian construction.

Moreover, to approach the problem of social evaluation from the perspective of what the rational individual would be willing to accept from a position of complete ignorance about his future position or prospects leaves one with a residual problem of no small proportion. Granting that rational persons would agree to this or that principle from such an initial position, one can still ask: what claim does this principle now make upon us, here and now, as we face one another from positions that involve considerably less than the requisite amount of uncertainty?

This poses a problem not only for Harsanyi but also for John Rawls, who is, of course, responsible for a much-discussed parallel argument from uncertainty--albeit one that leads him to a quite distinct principle.²⁸ In recent years, Rawls has tended to respond to this question in the following way: the story we tell about what we would choose behind the veil of ignorance is simply an imaginative way of putting ourselves in mind of what a genuinely impartial moral perspective would require of us. That is, the veil of ignorance argument is really just a heuristic device, a way of getting at something implicit in a normative social perspective to which we all, to some extent or other, feel some allegiance.²⁹ Such a reconstruction, no doubt, can be illuminating. But consider those persons for whom the central question becomes what measure of allegiance is to be accorded to this principle--particularly when, given the imperfect world within which we live, it must compete with other interests and even ideals of ours? For such persons, this whole line of reasoning may seem less than fully satisfactory.

The promise held out by constructions such as those of Rawls and Harsanyi is that we might come to understand thereby that our commitment to a particular principle is grounded in something that lies at a respectable distance from that principle itself: that the ground is to be found in the very notion of rational (individual or social) choice. That is, it promises to do more than to simply give us back, albeit in a clarified form, what we already are disposed to believe; it promises an independent, and objective ground, from which to assess, among other things, our own commitments. That promise cannot be fulfilled, I think, if the veil of ignorance argument is merely heuristic.

I suspect that Harsanyi is less inclined to rest content with a purely heuristic interpretation of the uncertainty argument. But that simply confronts Harsanyi with the other problem--the one posed at the outset of this Section. Granting for the moment that a utilitarian principle falls out, as theorem, from a model of individual choice of a social policy under conditions of radical uncertainty, why when we do not actually face one another under conditions of such radical uncertainty, should we structure our relations in accordance with

that utilitarian principle?

11. Some Closing Thoughts

The conclusion I have reached is that in so far as the utilitarian principle purports to be the basic principle for the evaluation of social policy, it is a doubtful principle. The problem, I have suggested, is not that it must be insensitive to two fundamental concerns--the problem of deprivation, and the problem of equality; the problem lies elsewhere. First, many of the arguments designed to secure this result end up according the utilitarian principle the status of a mere schematism, or at best something that emerges from a formal representation theorem--and, hence, something which does not speak to any substantive issues at all. Second, even if some such social choice construction could be construed to yield a substantive utilitarian constraint, it would have to presuppose something highly questionable, viz., the normative validity of some version or other of a strong separability axiom and the continuity axiom. Finally, to the suggestion that it can be recovered via the notion of that to which a rational self-interested person would agree, under conditions of radical uncertainty, one must reply, first, that such an argument once again presupposes strong separability and continuity axioms, and, second, that even if such an argument does go through, it is powerless in itself to bridge the gap back to the world we know.

Despite these cautionary thoughts, I think there is one very interesting line of reasoning that can be used to support a utilitarian principle, and one that does invoke, albeit in considerably attenuated form, the concept of choice under conditions of uncertainty (or risk). The argument I have in mind is one that can be adapted from the analysis that Buchanan and Tullock offer, of conditions under which rational persons would be willing to agree to a majoritarian principle of voting.³⁰ They argue that the representative individual must expect that if social decisions can be made with less than unanimous consent, then policies will be implemented that work to his disadvantage, whereas under a unanimity rule, of course, he has veto power over any policy that would disadvantage him. However, the decision-making costs associated with the operation of the unanimity rule are significant, as measured both in terms of the expenditure of time and other resources to reach compromise agreements that will win the support of all and in terms of opportunity costs. If these decision-making costs are sufficiently high, the individual will find it in his interest to support less-than-unanimity voting rules. The key argument here explicitly invokes the concept of uncertainty:

Essential to the analysis is the presumption that the individual is *uncertain* as to what his own precise role will be in any one of a whole chain of later collective choices that will actually have to be made. For this reason he is considered not to have a particular and distinguishable interest separate and apart from his fellows. This is not to suggest that he will act contrary to his own interests; but the individual will not find it advantageous to vote for rules that may promote sectional, class or group interests because, by presupposition, he is unable to predict the role he will be playing in the actual collective decision-making process at any particular time in the future. He cannot predict with any degree of certainty whether he is more likely to be in a winning or a losing coalition on any specific issue. Therefore, he will assume that occasionally he will be in one group and occasionally in the other. His own self-interest will lead him to choose rules that will maximize the utility of an individual in a series of collective decisions with his own preferences on the separate issues being more or less randomly distributed.³¹

Now, it would seem plausible to suppose that under somewhat analogous conditions individuals might agree to the use of a utilitarian calculus. In so far as the representative individual desires to see his interests promoted, but is uncertain as to just what his specific interests will be on any given occasion, he might well find it to his advantage to support the operation of a rule that required the maximization of the sum of utilities (or income, or some other specific measure of value). Recognizing that the operation of such a rule will mean that on some occasions his interests will be sacrificed for the greater interests of others, still he may expect that over the long-run he will be a net gainer--that he will be more often on the advantaged than on the disadvantaged side, given the operation of this principle.

To the extent that any such defense of a utilitarian rule for policy decisions be constructed, however, it would be subject to precisely the same qualification to which Buchanan and Tullock subject the majoritarian voting principle. It is central to the argument they construct that it is rational for individuals to agree to a *constitution*, to the specification of different decision-making rules for different classes of policy matters. The rational individual may well be willing to support a simple majoritarian rule for cases in which substantial issues are not at stake, but insist on something more more approximating a rule of unanimity for cases in which the costs to him of an adverse decision could turn out to be prohibitively high. In that latter category, they suggest, will be policy decisions that modify or restrict the structure of individual human and property rights:

The relevant point is that the individual will foresee that collective action in this area may possibly impose very severe costs on him. In such cases he will tend to place a high value on the attainment of his consent, and he may be quite willing to undergo substantial decision-making costs to insure that he will, in fact, be reasonably protected against confiscation.³²

By extension, then, we may also suppose that in so far as persons would be willing to agree to the operation of a utilitarian sum-ranking rule, they will also find it prudent to exempt certain classes of policy decisions from such a calculus. That is, they will regard the rule as appropriate to certain policy issues, and not for others. Roughly speaking, one could expect that some version of a utilitarian type sum-ranking rule might be selected as the appropriate rule for middle-level decision making, in which fundamental rights are not at issue in any substantial way, and where one expects a sufficiently large number of more or less similar issues to be settled by the use of the rule--issues on which one's own position is likely to be more or less randomly distributed, and hence where one can at least expect, over the long run, that things will balance out to one's advantage.³³

If this argument is correct, then the utilitarian perspective constitutes an important part of a comprehensive approach to public policy, but it fails to be fundamental in two different and very important senses. First, that it is rational to employ a utilitarian calculus for policy issues is a proposition that, in so far as it is true, has the status of a theorem, not an axiom; and second, the range of situations in which it would be rational to employ such a principle will be significantly limited.³⁴ Unlike most philosophers who have been drawn to a utilitarian perspective, those economists and decision-theorists who have sought over the last few decades to provide an axiomatic basis for a utilitarian principle have had a clear sense of the importance of the first of these two qualifications. Might not one hope that the time has come for some consensus on the second as well?

There is reason to hope, in this regard. The last few decades have witnessed two extraordinarily articulate and equally thoughtful presentations of the case against the conception of an unlimited scope for a utilitarian principle, one set forth by John Rawls (1971) and the other by Ronald Dworkin (1977). To be sure, as many have read the debate that followed the publication of Rawls's work, and as I indicated above, there is something inconclusive about the argument from behind the veil of ignorance. At the very least, it would seem, Harsanyi has an equally powerful version of the argument that supports a utilitarian principle.³⁵ And, again, while Dworkin's brief for a theory of rights that sets constraints on the operation of a

utilitarian principle is powerfully advocated, still his own argument makes altogether too much of an appeal to intuition.

The line of reasoning I have pursued here, based on Buchanan and Tullock's argument in the *Calculus of Consent*, offers an alternative and perhaps more secure route to the conclusion embraced by both Dworkin and Rawls. That is, it provides a ground for Dworkin's intuitions about rights in a theory of rational, prudential choice; and it offers a way to reconstruct Rawls's argument from behind the veil of ignorance so that, while it may not yield Rawls's own theory of justice, it still serves to effectively underline what he finds so worrisome about the utilitarian principle.

Footnotes

1. The connection between the ordinalist interpretation of utility and the problem of interpersonal comparisons is, of course, more complicated than this brief remark might suggest. One can embrace a "cardinal" conception of utility and still deny the meaningfulness of interpersonal comparisons; alternatively, one can accept an ordinalist perspective and still insist on the possibility of "level" comparisons from one person to another.
2. The sense of this revived interest can be taken by consulting, for example, Smart and Williams (1973), Miller and Williams (1982), and Sen and Williams (1982); the latter two also contain excellent bibliographies.
3. The terminology here is that introduced by Amartya Sen. See, Sen (1979, p. 468).
4. The results of particular relevance to the present discussion are due primarily to the work of Harsanyi (1953, 1955), d'Aspremont and Gevers (1977), Deschamps and Gevers (1978), Hammond (1976), and Maskin (1978). They are constructively analysed in a most perspicacious manner in Sen (1977b).
5. Following Sen (1970, 1977b), these are more properly characterized as functionals. For the sake of keeping the exposition as simple as possible, I shall pass over this important distinction.
6. For various ways of characterizing the requisite separability assumption, see, for example, von Neumann and Morgenstern (1944), Samuelson (1952), Savage (1972), Anscomb and Aumann (1963).
7. See Sen (1977a, p. 153).
8. See, for example, Sen (1969)

9. See, for example, Yaari (1981)

10. Thus Rawls, for example, who is opposed to the utilitarian approach, is prepared to acknowledge that the demand for equality must be tempered by considerations of what is required to provide persons with incentives. See Rawls (1971, p. 78)

11. Thus there should be no issue here, contra Harsanyi (1975b, pp. 320-22), about double-counting if one does want to introduce dispersion considerations. This was a charge that Harsanyi levelled against Sen, among other persons. For the exchange between them, see: Sen (1976), Harsanyi (1976), Sen (1977a), Harsanyi (1977).

12. Not all will agree, of course. For example, Mirrlees has recently argued in a fashion that might seem to set him at odds with this cautionary note. See his article, "the Economic Uses of Utilitarianism," in Sen and Williams (1982), and, in particular his remarks on pp. 70-71. Of course, at that point the utilitarian theorists still has a formal move open to him--the one suggested, in fact, by Mirrlees. He can cling to the simple sum-ranking rule, and insist that not only relative amount of income (or other goods), but other aspects of the dispersion of income (or other goods) can be understood to be encoded into the W_i 's.

13. See, however, Sen (1973, 1977), and Roberts (1980).

14. The designation is due to Sen, and it should be noted that Mirrlees has complained! See, for example, J. A. Mirrlees, "The Economic Uses of Utilitarianism," in Sen and Williams (1982, p. 77, fn. 22)

15. In the presence of the assumption that individual utilities are a strictly concave function of income, this also implies that the social welfare function itself will be strictly concave. See Sen (1973, p. 51).

16. I infer from this that when Sen remarks (1979, p. 471) that egalitarian considerations can be easily accommodated within the Mirrleesian approach, this remark needs to be qualified. Since there are ways of introducing egalitarian considerations that cannot be accommodated in a separable framework, and the Mirrleesian approach satisfies the condition of separability, it cannot be that the Mirrleesian approach can accommodate any egalitarian approach. More specifically, I take it, it cannot accommodate methods that involve use of linear measures of dispersion, like the Gini Coefficient or non-squared measures of mean-deviation.

17. See, for example, Markowitz (1959, p. 288), Fishburn (1977), Sen (1973, p. 34, fn. 11)

18. One can, of course, seek to avoid this problem by carefully constructing one's representation so that one has to work only with segments of the quadratic function for which the derivative is still positive.
19. It is in this context that there seems to be more force to Harsanyi's suggestion that one wants to avoid a "double-counting" of dispersion considerations. See, for example, (1975, p. 320-21). Moreover, this whole approach seems to be a natural extension of the one that Harsanyi adopts in Section 5 of (1975). That he characterizes such an approach as "super-egalitarianism" suggests that he supposes one has already encoded egalitarian concerns with respect to distributions of income by transforming them into distributions of strictly concave utility functions of income.
20. The imposition of separability in this context is not quite so restrictive, since, as indicated, imposing separability at the level of concave transformations of the component entries in a given n -tuple of incomes (or utility values), does not necessarily force separability on the underlying n -tuples of incomes (or utility values).
21. This is not to say, of course, that all those interested in axiomatic approaches to social choice have neglected these issues. Sen (1973) is particularly relevant here, and there are extensive references there to others who have been concerned with the issues of equality.
22. The literature on utility theory is filled with discussions of empirically documented violations of both of these axioms, and of counterarguments to taking either as normative for choice. Concerning the separability axiom, see Ellsberg (1962), Allais and Hagen (1979), Kahneman and Tversky (1979), Tversky (1975), Tversky and Kahneman (1981), Machina (1981, 1982), McClennen (1983, 1988); for discussions of utility theory without the continuity axioms, see, for example, Chipman (1971), and Hausner (1954).
23. Notice, once again, that the issue raised here is strictly independent of the issue about interpersonal comparisons. Even if such comparisons are possible, it is an open question as to whether evaluation of distributions of individual utilities (or the underlying distributions of income) should be evaluated in a manner that permits of a separable representation.
24. Harsanyi (1978, p.)
25. Ellsberg (1961)
26. See, for example, Diamond (1967), Sen (1973, 1976, 1979), McClennen (1981). Harsanyi has responded vigorously. See Harsanyi (1975, 1976, 1977)

27. Note, for example, that acceptance of the continuity axiom rules out in particular the lexical version of Rawls's difference principle.

28. Rawls (1971)

29. See, for example, Rawls (1980)

30. Buchanan and Tullock (1961)

31. *ibid*, p. 78

32. *ibid*, pp. 73-74

33. It might be argued, of course, that this argument invokes a level of uncertainty comparable to that invoked by Rawls and Harsanyi and, as a consequence, that it is subject to the same problem posed in Section 10, viz., how to bridge the gap back to the real world. My own sense is that the Buchanan and Tullock argument presupposes a much restricted and "realistic" level of uncertainty, and that the bridging problem is thus considerably less severe.

34. It should also be remarked that when the principle is applied at this level, it is better construed as a principle governing distributions of income (or other goods that are "objectively" measurable), rather than as a principle of aggregating utilities.

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AGRICULTURAL SECTOR ANALYSIS AND RURAL DEVELOPMENT:
SOCIAL SCIENCE RESEARCH PRIORITIES

Clark W. Reynolds*

Introduction

The purpose of agricultural sector models has been "to capture the most important structural and behavioral relationships within agriculture and between agriculture and the rest of the economy, on the one hand, and to be potentially useful to the policymaker as a planning tool to help select and formulate a sector program on the other hand."¹ Given the objectives of the Social Science Agricultural Agenda Project and issues perceived to be central to rural development in late-developing countries, the primary focus of this paper is on applied, multidisciplinary problem-solving research rather than on modeling techniques per se, important as agricultural sector analysis has been to the advancement of basic research in this area.² The emphasis will be on the relationships between agriculture and the rest of the economy with implications for policymakers as well as those specializing in social science agricultural research and its applications to developing countries.

It will be argued that the need to deal with pervasive underemployment in the rural and urban transitional sectors requires a new and more comprehensive

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¹ Thorbecke, Eric, "Sector Analysis and Models of Agriculture in Developing Countries," Food Research Institute Studies, Vol. 12, No. 1, 1973.

² Johnson, Stanley R., "Future Challenges for Modeling in Agricultural Economics," AJEA, Vol. 68, No. 2, 1986; Johnson, "A Critique of Existing Models for Policy Analysis," Agricultural Models for Policy Analysis, eds. A.A. Hassan and H.B. Huff, "Agriculture Canada," 1985; Johnson and Rausser, Gordon, "Systems Analysis and Simulation: A Survey of Applications for Agricultural and Resource Economics," A Survey of Agricultural Economics Literature, Vol. 2, University of Minnesota Press, 1977; and Thorbecke, Eric, *ibid.* These survey articles review past experiences with agricultural sector models, primarily in industrialized countries, focusing on innovations in modeling techniques. The applications of such models for solving contemporary IDC rural development problems is at present limited, though in certain countries they have proved useful for simulating farm level responses to macro-level policies.

framework for rural development analysis than that which has been applied in most agricultural sector analysis to date. This framework may be termed a cross-disciplinary social systems approach to rural development analysis. Such an approach would draw upon detailed micro-level economic, social, and technological studies of farm households and related production units, both agricultural and non-agricultural, in terms of dynamic optimization, technology adoption, budget analysis, on and off-farm labor allocation including migration, and investment in physical and human capital. Specifically, research on rural development would be extended to cover links between farm household behavior and the evolution of non-agricultural activities in the rural sector as well as contiguous urban areas. This would permit a study of the tradeoffs between diversified rural development and the present trend toward the concentration of production and employment in major metropolitan areas, with the added "escape valve" of external migration.

Formal agricultural sector modeling, which until now has tended to concentrate on agricultural production, might well be extended and modified to facilitate the study of these strategic tradeoffs. But formal models cannot substitute for the micro-analysis of rural decision-making units which are likely to display crucial adaptations in individual and institutional behavior, subject to a wide range of social, political, economic, and technological options. From this viewpoint, there is increased scope for rural social science research in both developed and advanced industrial countries, not to mention the need for increased financial support from non-governmental organizations and official lending institutions to permit the expansion of such research in collaboration with scientists from the developing countries. Given the increasing degree of international economic, social, and political interdependence, such activities which lead to a proliferation of productive employment are bound to serve the interests of both donor and recipient countries.

The Problem of the Rural Sector and Underemployment in Late Developing Countries

Considerable progress has been made in increasing agricultural production and productivity in most developing regions. A generation or more of economic research has confirmed what many social scientists already knew, that peasant farmers are rational in their response to prices, the adoption of profitable innovations, and other opportunities for the transformation of traditional agriculture, subject to reasonable margins for risk.³ National and international agricultural research and development programs have led to impressive breakthroughs in seed/fertilizer technologies applicable to tropical agriculture, permitting windfall gains in the yields of basic food crops in important areas of the developing world. The widespread adoption of these techniques, along with market-driven and policy-induced increases in production in the traditional food export economies, have reversed global expectations in only a few decades. Malthusian predictions of famine from food shortages have changed to concern about over-production and low commodity prices.

³ Jones, W.O., "Economic Man in Tropical Africa," Food Research Institute Studies, Vol. 1, No. 2, 1960.

Miracles have been accomplished. Yet in many parts of the developing world malnutrition is widespread and growing. Schuh characterizes the international agricultural economy today as being "in a massive disequilibrium."⁴ The same "disequilibrium" situation exists within many developing countries, including Brazil, India, Indonesia, Mexico and Nigeria (indeed through much of tropical Africa). As a consequence, for many the issue today is distribution even more than production. How can agricultural productivity growth and increased and improved food consumption be diffused among nations, regions, and social groups to serve the joint goals of allocative efficiency and equity? The resolution of such issues is an international problem that goes well beyond agricultural sector analysis, and cannot be addressed without taking a comprehensive approach to rural development.

The issue of food distribution has given rise to moral philosophical approaches which stress the social implications of basic human needs.⁵ Such approaches focus on the reallocation of income and purchasing power to insure adequate levels of welfare to all social groups. A short-term direct approach to the problem of entitlements is through direct policy-induced transfers. A more indirect but permanent approach is to create the means for disadvantaged groups to increase their income and purchasing power through new opportunities for productive employment and more equitable participation in all aspects of the development process.

In the area of food policy, traditional distributional schemes have tended to utilize price ceilings and broad based state distribution and food aid programs. These are costly measures which have been shown to work against agricultural development in recipient countries by depressing farm-gate prices, while providing consumption subsidies often independent of recipient household incomes. Alternative direct transfer schemes have been devised to permit a more selective targeting of food subsidies, through the selective provision of food stamps and related measures, aimed at those groups which are most nutritionally at risk. Such programs are designed to reduce the cost of food subsidies with fewer distortions of agricultural prices and a more equitable allocation of the benefits. The programs are of considerable value, particularly where targeting is most cost-effective, such as in urban slum areas, though there is a danger that the costs may become excessive in the case of the rural poor.⁶

However, even the most efficient food distribution schemes deal at best with relief of the symptoms of poverty rather than its root causes. Low incomes are a function of low labor productivity and the associated lack of diversified remunerative employment. Persistent and growing urban poverty in late-developing countries traces back to a lack of diversified development in the rural sector and at the regional level. This in turn stems from a failure

⁴ Schuh, G. Edward, "International Development and Affairs," from Social Science Agricultural Agenda Project Proceedings of Phase I Workshop, Minnesota, June 9-11, 1987.

⁵ See, for example, Sen, A.K., Poverty and Famine: An Essay on Entitlement and Deprivation, Clarendon Press, Oxford, 1981; and Rawls, John, A Theory of Justice, Harvard University Press, Cambridge, Massachusetts, 1971.

⁶ Timmer, C.P., Falcon, W.P., and Pearson, S.P., Food Policy Analysis, A World Bank Publication, Johns Hopkins University Press, 1983.

of rural development policy to address the problem of rural underemployment outside of agricultural production.

Notwithstanding impressive gains in agricultural production and productivity in developing countries, and the need to further diffuse such gains in regions where productivity remains low, the problem of rural underemployment has grown beyond the dimensions of traditional agricultural development strategies. Even where distortions in factor prices have been eliminated, along with barriers to the pursuit of dynamic comparative advantage in agricultural production, agriculture alone is proving incapable of absorbing increases in the rural labor force in much of the developing world. There is an inadequate diversification of non-agricultural investment in rural areas and adjacent towns, largely as a result of insufficient infrastructure and overconcentration of industrial and service development in the major metropolitan areas.

Since agricultural growth alone is proving incapable of meeting the employment needs of the rural population, there exists a burgeoning number of rural underemployed forced to supply labor services at subsistence wages. The absence of productive opportunities in the rural areas leads to excessive rural to urban and international migration, serving to dampen real wage increases in the receiving regions regardless of productivity growth there. In some cases the modernization and commercialization of peasant agriculture may even exacerbate the problem, by displacing peasant cultivators through the consolidation of small-holdings, dividing up families and forcing them into a rural proletariat. This is not to condemn the commercialization process, which clearly generates additional rental streams which may be saved and reinvested in further employment creation, but rather to describe its effect in terms of social dislocation, income instability, and the uncertainty of job search for peasant producers who previously cultivated their "own" plots through rental or sharecropping. The effect is to exacerbate the problem of underemployment stemming from labor abundance in rural areas.⁷

The integrated rural development approach which was given considerable attention in recent years had the advantage of focusing not only on agriculture, but on programs of technical assistance, basic infrastructure, rural education, health care, and nutrition. However there has been insufficient focus on the problem of rural underemployment and the development of diverse employment opportunities on farms and adjacent villages and towns. Hence such programs failed to deal with the dynamic of a burgeoning rural population which (even because of such programs) learns to expect improvements in income and welfare along with ever-higher levels of education and improved employment opportunities for future generations. Moreover, integrated rural development programs had their own limitations, since they tended to draw

⁷ The author has observed this process throughout Central America, as increased commercialization of agricultural land for export crop production has raised its rental cost to levels beyond the reach of peasant households. As a result the growth of agricultural production, productivity, and exports took place alongside the impoverishment of the landless peasantry. See Reynolds, C.W., "Employment Problems of Export Economies in a Common Market: The Case of Central America," in eds. W.R. Cline and W. Delgado, Economic Integration in Central America, the Brookings Institution, Washington, D.C., 1978. See also Reynolds, C.W., "Fissures in the Volcano: Central American Economic Prospects," in ed. J. Grunwald, Latin America and the World Economy: A Changing International Order, Sage Publications, 1978.

scarce human resources and financial capital from urban centers to support programs that could not be sustained once those inputs were removed.

Lessons from the Agricultural Development Experience

Some of the earliest efforts to place the agricultural sector in the context of general development theory made use of basic two-sector models, rural and urban, in which the principle link was through labor flows from agriculture to industry.⁸ Raul Prebisch and the Economic Commission for Latin America argued that agricultural productivity growth would release labor to the urban sector, along with increased food production, making possible strategies of import substituting industrial development (to be paid for, implicitly, by distortions in the urban/rural terms of trade). In these models there was little discussion of the process of labor transition from agriculture to urban employment or concern about the possibility of increased underemployment and lagging real wages arising from growth in the supply of rural labor exceeding the absorptive capacity of urban demand.⁹

Johnston in his pioneering work on the history of Japanese agricultural development described a revealing success story in which increases in agricultural productivity were associated with significant growth of non-agricultural employment in both major metropolitan areas and rural communities. This experience is worth examining in considerable detail, since it suggests lessons on the potential diffusion of development strategies. Apparently, Japan was able to promote significant increases in both rural education and regional industrial growth so as to draw labor into non-agricultural employment at increasing levels of productivity and real wages, without the degree of dislocation and excess urbanization that now characterizes many of the late-developing countries. This was possible in part because of the relatively low rate of population growth in Japan (about 1 per cent per annum) during its "demographic transition" when the farm labor force began to decline in absolute terms.¹⁰

The U.S. experience relied much more on migration of labor to major metropolitan centers, as we see from the synoptic "History of American agriculture from Jefferson to Revolution to Crisis" prepared for the first

⁸ The classical models of W. Arthur Lewis ("Economic Development with Unlimited Supplies of Labour," *The Manchester School*, Vol. 22, 1954), and Fei and Ranis ("Agrarianism, Dualism and Economic Development," in Irma Adelman and Eric Thorbecke, eds., The Theory and Design of Economic Development, Johns Hopkins University Press, 1966), both of which assume an "institutionally determined" wage rate in the rural sector and zero marginal productivity of labor. And the neoclassical framework of Dale W. Jorgenson ("The Development of a Dual Economy," *Economic Journal*, Vol. 67, No. 268, 1961), where wage rates are determined in an intersector labor market, and the elasticity of agricultural output with respect to labor is a function of new technology.

⁹ The ILO did sponsor a few major studies of urban underemployment for countries such as Colombia (Dudley Seers) and the Philippines (G. Ranis), which tended to stress the need to remove distortions in relative factor prices to increase the labor-capital ratio. However, such efforts tended to stay within the conventional rural-urban dichotomy and did not deal with what are termed in this paper "transitional sectors."

¹⁰ Johnston, B.F., "The Japanese 'Model' of Agricultural Development: Its Relevance to Developing Nations," in Ohkawa, Johnston, and Kaneda, eds., Agriculture and Economic Growth: Japan's Experience, University of Tokyo Press, 1969.

SSAAP meeting by Richard Kirkendall.¹¹ The impressive growth of agricultural production and productivity in the U.S., along with increased rural wages and farm incomes, was associated with new income streams (to use Schuh's terminology) brought about by labor-displacing technology appropriate for large-scale cultivation on highly productive land with adequate rainfall or irrigation. Ultimately most of the U.S. agricultural workforce relocated in urban areas, where growth was sufficiently rapid to permit significant increases in real wages. This pattern of massive rural-to-urban migration is not an option for many late-developing countries, at least in the short- to medium-run.¹²

What was regarded as a relatively automatic and mutually beneficial movement of labor from the rural to urban sectors only a few years ago, associated with increased agricultural productivity growth, is now clearly a problem that afflicts not only Latin America and the Caribbean but Africa and South Asia as well. Sen has shown that India's impressive growth in agricultural production and productivity in response to new seed varieties, fertilizer, and irrigation, has not led to a comparable diffusion of productive employment in the rural sector. This has led to an underemployment crisis, so that important components of the population of the Indian subcontinent are unable to purchase the food that the country produces, leading to export surpluses side by side with poverty and malnutrition.¹³ While some have been tempted to attack the Green Revolution for such disparities between productivity growth and productive employment, such arguments reflect a latter-day Luddite confusion between cause and effect. The problem is not that new technologies were bad because their incidence was uneven by region, type of agriculture, and income class. Rather there was a failure to develop other complementary labor-absorbing technologies in transitional sectors that might have provided alternative employment to those unable to reap the direct benefits of agricultural technology.

Must late-developing countries wait for the pull of industrial growth in major cities, in order to experience significant increases in wages and per capita incomes through rural-to-urban migration? Will rural populations tend to dry up in LDC's as they have in advanced industrial countries? Professor Schuh, citing John R. Mills, T.W. Schultz, and B.F. Johnston, refers to the "one iron law of economics" in which the agricultural share of employment declines as development proceeds. "This 'law' is important because it creates a serious adjustment problem for agriculture that is rooted in the forces of economic development." Given an income elasticity of demand for food that is less than that for non-agricultural goods and services, there is a tendency for labor to shift out of agriculture as per capita incomes rise, and this is exacerbated by the tendency of the natural population growth rate in rural areas to exceed that in urban centers at the same time technical change in agriculture tends

¹¹ Kirkendall, R., "The Situation, Problems, and Issues--Today and Tomorrow", in Social Science Agricultural Agenda Project Proceedings of Phase I Workshop, Minnesota, June 9-11, 1987.

¹² See the Alan Olmstead, ed., issue of Agricultural History, Vol. 60, No. 1, 1986, on comparisons between American and Mexican agricultural historical experiences, especially articles by Roger Ransom Gary Libecap, and Warren Whatley.

¹³ Sen, A.K., Employment, Technology, and Development, a study prepared for the ILO, Clarendon Press, Oxford, 1975.

to reduce the demand for labor.¹⁴ In the future, rural sector analysis must deal with ways in which this iron law may be moderated so as to avoid the establishment of a low level equilibrium trap of labor in major urban centers, by providing diverse employment opportunities in rural areas and surrounding towns.

Agricultural policy analysis will increasingly be challenged to find ways to further the diffusion of sectoral productivity gains through the rest of the economy, and analytical modeling will require more attention to non-agricultural linkages at the household and regional levels. The rural-urban transition, which was once regarded as a normal by-product of increased agricultural productivity and industrialization, has given rise to new complexities in recent years, owing to the lagged effect of the demographic explosion on the supply of labor emanating from the rural sector and the relatively limited absorptive capacity of industrial development as it has proceeded in most LDC's. Education alone and conventional definitions of integrated rural development are insufficient to deal with the economics of the transitional sector.

As Johnston, Kilby, and Tomich report in a forthcoming comparison of the earlier Taiwan and more recent Mexican experiences, "With the share of total labor force in agriculture down to 37 percent in 1980 (in Mexico), expansion of employment opportunities in the nonfarm sector, both rural and urban (emphasis mine), is of even greater importance than the absorption of labor into productive employment in the agricultural sector."¹⁵ The authors make the point that late-developing countries such as Mexico face more complex problems of labor absorption than did the "success stories" of Japan, Korea, and Taiwan. A recent book by M. Grindle makes a similar point that agricultural production is no longer viable as the "engine of growth" for rural Mexico, though it was successful in Japan, Taiwan, and the Indian Punjab. Instead she sees a diversified rural employment strategy (emphasis mine) as the key to rural development in Mexico. Without off-farm opportunities, the rural population will continue in increasing numbers to seek income through temporary and permanent national and international migration.¹⁶ My own work on shift-share analysis of total factor productivity growth in Mexico indicates clearly that the shift of labor from agriculture to the major urban centers is associated with a sharp deceleration and even decline in output per worker in greater Mexico City, a decline which is concentrated in the tertiary sector and particularly low-productivity services (which have absorbed most of the employment growth in the last two decades). Whereas a significant component of national productivity growth in earlier years was associated with shifts of labor from rural to urban activities, it is now evident that this movement is exerting a negative pressure on Mexican development. It is clear that regional

¹⁴ Schuh, G. Edward, "International Development and Affairs," op. cit.

¹⁵ Johnston, B.F., "Sequences of Choices and Consequences: Taiwan and Mexico," from the forthcoming book with Peter Kilby and Tom Tomich, 1988.

¹⁶ Grindle, M.S., Searching for Rural Development: Labor Migration and Employment in Mexico, Harvard Institute for International Development, 1987.

productivity enhancing policies which slow the rate of movement to the major cities are essential to future development.¹⁷

Finally, an ingenious and persuasive model has been developed by de Janvry and Sadoulet to illustrate that "a 'broad based' pattern of rural development, as opposed to agricultural development with concentrated landownership and hired laborers under conditions of surplus labor, will support a larger long-run aggregate demand creation and import demand for coarse grains and feedstuffs."¹⁸ This paper focuses on the consequences for increased industrial production and productivity (and feed grain imports), from a broader distribution of the gains from food grain production, which would result from a broad-based rural development strategy aimed at increased employment, wages, and productivity in the agricultural sector. It would be interesting to extend the analysis to explore the positive impact on industrial growth and the gains from trade from a rural development strategy in which increases in productivity and employment in the rural sector extend beyond agriculture.

Links between Agriculture and the Rural and Urban Transitional Sectors

Given the goals of increasing real wages, alleviating poverty, and expanding the national market, there are two critically important sectors of the economy that have hitherto been understudied. These are termed here the "transitional sectors" since they provide employment for labor released from agricultural production and unable to find employment in the urban formal sector. The first and most important of these sectors from the viewpoint of a broader approach to rural development is the rural transitional sector. In this context, the term "sector" includes occupations and productive activities within farm households and related institutions as well as in nearby cities and towns where members of such households are employed. These occupations and activities are not always directly within the agricultural sector, though they may well have forward or backward linkages to agriculture.

The other locus of transitional employment for labor supplied by the rural sector is the urban transitional (or urban informal) sector. This sector is distinguished from the rural transitional sector by requiring a major relocation of rural labor, customarily a movement to one of the major metropolitan centers. Earnings differentials between the urban formal and rural sectors attract rural-to-urban migrants. Gravity models of labor market diffusion indicate that institutional barriers to entry into the formal sector permit these differentials to remain, leading to employment of the bulk of rural-to-urban migrants in low-level services and other informal sector activities. The hypothesis here is that a given degree of support for employment generating policies in the rural transitional sector would offer greater prospects for the diffusion of productivity gains, domestic market

¹⁷ Reynolds, C. and Alejo, F.J., "Effects of Intersectoral Labor Shifts on Productivity Growth in Mexico: Implications for the United States," paper presented to the International Economic Association World Congress, New Delhi, Dec. 3, 1986, mimeo.

¹⁸ De Janvry, A., and Sadoulet, E., "The Conditions for Harmony between Third World Agricultural Development and U.S. Farm Exports," Department of Agriculture and Natural Resources, University of California, Berkeley, presented at the Annual Meeting of the American Agricultural Economics Association, July 28 to 30, 1986.

expansion, and labor absorption than has been appreciated by policy-makers to date. The alternative to such policies is the continued flooding of the urban transitional sector, associated with "overcrowding" and the profusion of an underclass in the major metropolitan areas of the third world.

Conventional two-sector models of rural and urban development tend to ignore the role that transitional sectors may play in the spread of productivity growth throughout the labor market. If permitted to develop, and provided with adequate infrastructure and access to capital and intermediate goods, the rural transitional sector may provide a demand pull, speeding the growth of real wages and the widening of the domestic market. However, lacking these conditions, it may simply act as a sponge for underemployed labor, diffusing the productivity gains from other sectors over a widening share of the work force, depressing the domestic terms of trade for informal sector activities and perpetuating the impoverished conditions of the underclass.

When one reviews the experience of the advanced industrial countries, it is apparent that the dynamic role of these transitional sectors was critically important to the capture and transmission of rural rents into further productivity gains and the extension of national markets. Many of today's major production centers including Sao Paulo, Chicago, and Kansas City evolved from commercial outposts that formed part of the rural transitional sector. Their development owed in part to improvements in transportation, communication, and infrastructure as well as changes in agricultural and animal husbandry technology and the opening of adjacent regions to cash crop production for national and foreign markets. There are regional centers throughout the developing world which have already begun to reveal their growth potential by providing inputs to the surrounding rural communities, engaging in food processing, and acting as entrepôts for crop production for shipment to major urban markets or abroad.¹⁹

Need for a Broader Rural Development Modeling Framework

An analytical framework capable of dealing with the employment and income generating effects of alternative rural development strategies would include both the agricultural and rural transitional sectors, and would show how complementary activities in each might lead to a broader social distribution of productivity gains throughout the economy. This augmented rural sector model would fit more effectively into a national development framework in which the urban economy is also disaggregated into its formal and transitional components.

In Latin America there has been growing interest in the role of the urban informal sector. Some see this sector as productivity-enhancing in its own right,²⁰ permitting economic growth in areas repressed by government and business barriers to competition in the formal sector. Others see the informal sector as a pool of underemployed labor subject to exploitation, and

¹⁹ The case of Zamora in Michoacan, Mexico, studied by rural sociologists, reveals significant multiplier effects on production and employment have resulted from booming strawberry production of adjacent small irrigated farms.

²⁰ De Soto, H., El Otro Sendero: La Revolucion Informal, Editorial El Barranco, 1986.

a latent political pressure group that is uncoopted by the state and can be mobilized to apply political pressures for regime changes. Whichever approach is taken, there is little question that the urban economy, formal or informal, is unable to absorb sufficient rural labor at rising real wages in many late-developing countries. If growth is to take place with a reasonable balance in income shares by regions, social groups, occupations, and educational levels, the rural transitional sector will require major attention in conjunction with growth of agricultural production and productivity.

The evidence of many countries indicates that there is no guarantee that improvements in agricultural production and productivity will increase real wages for the mass of the rural population, if the supply of labor is sufficiently elastic. Indeed unbalanced productivity gains may depress the terms of trade of food crops with an adverse impact on the rural wage level, despite increases in marginal physical product. Moreover, when the rural workforce exceeds the supply of land available for subsistence cultivation, labor will be "pushed" into the cities, depressing wages in the urban informal sector and increasing the elasticity of supply of low skilled labor throughout the economy. In short, just as a developing agricultural economy may release a "surplus" of resource rents for diversified development, it may also release a parallel "surplus" of low-wage labor that will swell the urban underclass and increase pressures for emigration. Hence the rural development problem to which sector analysis must direct its efforts in the coming years, in my view, is to find ways to productively employ the labor that is released by the "iron law of agricultural development." Notwithstanding the experience of advanced industrial countries, there may not have to be an "iron law of rural development" for all late-developing countries, even though the share of agricultural production and employment for most economies is bound to decline during the development process.

Abundant low-wage labor acts as a limiting factor on the achievement of balanced growth in productivity and income throughout the economy of such countries. To the extent that international immigration provides an outlet, such labor offers a dimension to international labor market adjustment that is quite different from the typical "brain drain." In the case of the brain drain, skilled labor takes its human capital from LDC's to industrial countries, in pursuit of higher wages, complementary benefits, creative opportunities, and other amenities. In the case of unskilled labor, however, the LDC with an elastic supply of rural labor (and a growing urban underclass) is forced to export people instead of goods and services, since the productivity of their labor services is greater abroad than at home. Labor productivity-enhancing policies in the sending regions (including the rural sector), combined with increased openness to trade, could enable the export of embodied labor services in the form of tradables, permitting the productivity gains to be retained within the exporting country along with a rising level of domestic real wages, aggregate demand, and the opportunity for economies of scale.

But there is no guarantee that this will happen. W. A. Lewis shows that for long periods at the end of the 19th and beginning of the 20th century, much of the world's tropical agricultural regions failed to exhibit significant gains in real wages, despite commercial agricultural productivity growth per unit of land and labor. The rents from such gains remained concentrated in the hands

of land- owners, processors, and intermediaries. It was not necessary to impose the institution of slavery or monopsony in labor markets for such results to occur, provided that population growth (and labor supply) remained sufficiently elastic. He claims that the offer price of labor (and real wages) might have increased had there been a parallel transformation of productivity in "domestic foodstuffs." There are important lessons for today's developing countries in this experience, since it demonstrates that agricultural productivity growth is a necessary but insufficient condition for increased rural wages--if that growth is unbalanced and if the population growth rate is sufficiently high. That is why Lewis attributes the growth of dualism in the 19th century labor markets to asymmetrical technological progress.²¹

Summary and Suggestions

This paper has argued that there has been inadequate analysis of peasant agriculture in terms of linkages with employment, productivity, and income-enhancing activities that would favor a diffusion and diversification of development to lagging subsectors, regions, and social groups. It has been said that the global food and agricultural problem is not one of production but distribution; but redistributive schemes do not necessarily come to grips with the problem of incorporation of rural society into the development process, nor do they address the issue of diversification of on-farm and off-farm employment in rural areas. We know that population will move out of low income regions, but at a significant economic and social cost. Sometimes that cost includes externalities from "brain drain" of human capital (and the outflow of financial capital) that could have been applied productively at home with appropriate incentives.

What research approaches make sense if one accepts the above objectives? What programs might be designed that would facilitate such approaches? This should be a central concern of the SSAAP. I suggest the fostering of case studies of successful rural development with the diversification of productive employment. Such case studies would include areas in Asia, Africa, Latin America, including examples from the history of advanced industrial countries, where balanced rural development has occurred. One would seek to identify those elements responsible for success and their policy implications. To the extent that patterns arise, there may be scope for simulation of alternative policy approaches, and the integration of such simulations into larger sectoral and national models which would permit consistency checks of regional and national behavior. For example, policies leading to industrial diversification at the regional level, to take advantage of labor released from agriculture, if generalized, would have to be consistent with national (and international) market conditions. It is likely that formal modeling of such processes at the micro-level would be difficult to accomplish without severe oversimplification of the social and institutional environment so important to success or failure. In this regard, the desire for formal

²¹ See Lewis, The Evolution of the International Economic Order, Princeton University Press, 1977. One might add the effect of a distorted pattern of international migration, where migration flows tended to be restricted to north-north or south-south patterns, rather than from south to north as in the present era.

modeling should not be allowed to eclipse the need for relevant social science analysis to accommodate a wider range of elements. However, purely ex post facto descriptive analysis does not lend itself to refutable hypothesis testing.

Ideally, social science research would attempt to adapt the "successful" rural development strategy to the region or country concerned in terms of its economic structure and growth, subject to changing degrees of rural-urban and international exchange. The interaction of economic, social, political, and technological dimensions would be explicitly treated. The object would be to take the analysis of rural development out of a "black box" by dealing specifically with social and institutional as well as economic relations, in order to isolate those elements (whether they be economic, social, political, or technological, whether they be behavioral or institutional) that account for the "successes" and "failures" that have occurred.

The ultimate goal is knowledge of systemic behavior, but the applicability is in terms of the design of appropriate rural development strategies. One wishes to build on foundations of research to date. The work should draw on a range of disciplines and conceptual models in a syncretistic manner. Judgement and field experience of the analysts involved would facilitate the selection of cases to study and methodological priorities. The approach taken would be designed to permit links between the broader dimensions of sector analysis in the context of changing economic and social systems, and applied microeconomic analysis of production, and price behavior, savings, investment and income determination.

The use of formal models (linear programming; input-output; computable equilibrium; and the application of social accounting matrices to such models) should be subordinate and complementary to the larger and more complex issues and approaches taken, rather than vice versa. The use of sector analysis as a vehicle for state of the art model-building is certainly worthwhile, but it is not the basic objective of rural development analysis, which is to identify the specific conditions necessary for successful incorporation of rural society into the development process in a sustainable manner. There should always be an attempt to draw policy implications from the analysis and to assure its wider applicability. In the process, the approach of "positive economics" as the application of logic and empiricism to the understanding of rural development is fundamental. The results should be presented in such a way as to permit the social choices over alternative strategies and approaches to be left to those whose interests are most directly affected.

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The Role of the Social Sciences in the Generation,
Dissemination and Evaluation of Institutional Change*

Vernon W. Ruttan**

Over the last several decades social scientists have made major contributions to our understanding of the impact of advances in natural science knowledge on technical change and of the impact of technical change on economic development and on the distribution of the gains and losses associated with development. We have also significantly advanced our understanding of the sources of demand for and supply of technical change. Work carried out within the framework of the induced technical change paradigm has demonstrated that technical change can be treated as largely endogenous to the development process (Hayami and Ruttan, 1971 and 1985; Thirtle and Ruttan, 1987).

Social scientists have made less progress in efforts to understand the contributions of advances in social science knowledge to institutional innovation or of contribution of institutional innovation to economic, political or social change. There has, however, been a renewed interest in issues of institutional change among social scientists. Within economics a new more analytical institutional economics has emerged to supplement the older historical institutional economics. The rational choice and public choice paradigms have facilitated more effective dialogue among economists,

role

15- 2

political scientists, sociologists and psychologists and historians. In spite of these advances our knowledge of the sources of demand for and supply of institutional change remains rudimentary.

In this paper I present a framework for thinking about the role of social science knowledge in the generation of institutional change. I then discuss the role of rural scientists' in the public institutions that generate, disseminate and evaluate technical and institutional change. I follow the lead of Commons and Knight and define institutions to include both the behavioral roles that govern patterns of relationships and action as well as decision-making units such as government bureaus, private firms, and individual families.¹

Institutional Reform and the Demand for Social Science Knowledge²

The basic concept on which the evaluation of the returns to agricultural production research rests is that the demand for knowledge is derived from the demand for technical change in commodity production. Once the output of research was clearly conceptualized as an input into the process of technical change in commodity production, processing, and distribution, this link made it possible to develop models to measure the ex post returns to research. It then became possible to make ex ante estimates of the relative contribution of alternative uses of research resources and to attempt to begin to specify rules that research managers might follow in the allocation of research resources.

Social scientists have only begun, perhaps somewhat reluctantly, to conceptualize adequately the contribution of knowledge in the social sciences (Stigler 1982, p. 60).³ The first step in an attempt to value new knowledge in economics, and in the social sciences generally, is to specify

the sources of demand for that knowledge. It is clear that the demand for knowledge in economics is not derived primarily from either private or public demand for technical change in commodity production. The demand for knowledge in economics and in the other social sciences -- as well as in related professions such as law, business, and social service -- is derived primarily from a demand for institutional change and improvements in institutional performance.

Shifts in the demand for institutional innovation or improvements in institutional performance may arise from a wide variety of sources. The Marxian tradition has emphasized the importance of technical change as a source of demand for institutional change. North and Thomas (1970, 1973) attempted to explain the economic growth of Western Europe between 900 and 1700 primarily in terms of innovation in the institutional rules that governed property rights. A major source of institutional innovation was, in their view, the rising pressure of population against increasingly scarce resource endowments. Schultz (1968), focusing on more recent economic history, identified the rising economic value of labor during the process of economic development as a primary source of institutional innovation. North and Thomas would apparently have agreed with Schultz that "it is hard to imagine any secular economic movement that would have more profound influence in altering institutions than would the movement of wages relative to that of rents" (Schultz 1968, p. 1120). It also seems more apparent today than a decade ago that in nonmarket environments, or in environments where prices are severely distorted, the shadow prices that reflect the real terms of trade among factors and products (or the gap between shadow and market prices) convey information to economic and

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15-4

political entrepreneurs that leads to shifts in the demand for institutional innovation and performance.

Conceptualizing the demand for institutional change in this manner opens up the possibility of a more precise identification of the link between the demand for institutional change and the demand for knowledge in economics and in the social sciences generally. Advances in knowledge in the social sciences offers an opportunity to reduce the costs of institutional innovation, just as advances in knowledge in the biological sciences and agricultural technology have reduced the costs of technical innovation in agriculture. The demand by policy makers for advances in knowledge about price and market relationships is, for example, appropriately viewed as derived from demand for improved performance on the part of market or nonmarket institutions.

What evidence can be brought to bear against the hypothesis that the demand for social science knowledge is derived from the demand for institutional innovation? Let me refer to two examples that tend at least to establish the plausibility of the hypothesis.

The first example draws on U.S. historical experience. during the last one hundred years, the United States has experienced three major waves of institutional reform. The first was the "Progressive Period" that spanned the last decade of the nineteenth century and continued until the U.S. entry into World War I. The demands for reform were induced by the rapid technical and economic changes that had dramatically altered the conditions of American life since the Civil War.⁴ The unifying theme that underlay the reform proposals of the Progressive Era was a rejection of unregulated free-enterprise capitalism. Reforms reflecting this

role

15- 5

perspective were initiated in the areas of income distribution, labor relations, social services, financial markets, transportation, industrial organization, and resource conservation. Popular demands for "direct democracy" were translated into expansion of women's suffrage, direct election of senators, and more active participation of voters in the legislative process through the initiative, referendum, and recall. A major consequence of these reforms was to widen substantially the participation of the federal government in economic affairs and in areas previously reserved to the states.

The second major wave of institutional innovation and reform was during the "New Deal" period in the 1930s. The question of whether the New Deal reforms represented a drastic new departure in American reformism (Hofstadter, 1955) or primarily the realization of reforms proposed originally during the Progressive Era (Scott; Hughes, pp. 146-98) and incubated during the 1920s (Chambers) has been debated by political scientists and historians. But the New Deal reforms are not too difficult to characterize. They were in defense of security of property, of work, and of income -- a reshuffle of the cards that had too long been stacked against the working man, the farmer, and the small businessman (Commager and Morris, p. xii). But the acceptance by the federal government of responsibility for maintaining economic life represented a radical break with tradition. The result was a period of six years, 1933 to 1938, that represented the most rapid period of institutional change since the Civil War (Leuchtenburg, p. xv).

The third wave of institutional reform occurred during the Kennedy and Johnson administrations -- the "New Frontier" and "Great Society" years of

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15- 6

1960-68. The Kennedy and Johnson administrations sought to complete the liberal agenda. They sought to eradicate racial discrimination in voting, housing, jobs, and schooling. And they sought to eliminate poverty -- both black and white and urban and rural (Matusow, pp. 180-271). These reforms were followed in the late 1960s and early 1970s by rapid innovation in new forms of property rights in natural resources induced by a rising concern about the impact of technology on both material resources and environmental amenities (Ruttan, 1971).

During each of these periods there was rapid growth in the demand for social science knowledge. The first period drew on a broad range of intellectual capacities and expertise in law, in economics, and in the newer social science disciplines -- but there was relatively little theory and even less research on which to draw. During the second period economists played a much larger role in policy design. Unfortunately, lack of an adequate understanding of macroeconomic relationships and a pervasive pessimism about the prospects for growth led to a structuralist reform agenda. But the demands for institutional innovation did lead to substantial growth in the resources devoted to social science research and to strengthening the statistical services of the federal government. By the late 1930s new theory and new information were being brought to bear on institutional innovation and reform. A new class of "service intellectuals" emerged in policy roles in the federal government. During the 1960s social science research played an even larger role in program design than in the two earlier periods. This was in part because of a greatly expanded body of social science knowledge, a large social research capacity, and improvements in capacity to generate, process, and analyze

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15- 7

social science data. Attempts were made to introduce experimental design as a stage in program development. But in spite of the advances in theory and method, the policy-relevant social science knowledge on which the Kennedy and Johnson administrations were forced to draw in the design of the poverty programs of the 1960s was too weak to respond effectively to the demands that were placed on it (Matusow, pp. 217-76).

Ideology and the Demand for Social Sciences Knowledge

The sources and impact of ideology have represented a blind spot in contemporary social science -- especially economics -- theory and research. Without a more explicit understanding of ideology there is an immense gap in our ability to understand the stability of institutions -- the willingness of individuals to behave in a manner that is inconsistent with individual self interest. Ideology provides a world view and a guide to act on that releases individual behavior from the necessity of "simple, hedonistic, individual calculus of costs and benefits" (North, 1981, p. 53).

Geertz argues that formal ideologies first emerge and begin to guide social thought and political and economic behavior at that point at which a society begins to free itself from the dominance of received traditions -- "from the direct and detailed guidance of religious or philosophical canons ... and from the unreflective precepts of conventional moralism..." (Geertz, 1964, p. 64). furthermore it is the ability of "ideologies to render otherwise incomprehensible social situations meaningful, to so construe them as to make it possible to act purposefully within them, that accounts... for the intensity with which, once accepted, they are held" (Geertz, 1964, p. 64).

role

15-8

In my work on induced institutional change I have tended to focus on the implications of economic growth and technical change on the demand for institutional change (Ruttan and Hayami, July 1984). I am now pursuing research on the evaluation of United States development assistance policy. When I initiated this research I assumed that the theory of induced institutional change would provide substantial insight in to the initial development and subsequent evaluation of development assistance policy. It is apparent, however, that we can not understand the commitment distribution of US foreign assistance since World War II, first for the rehabilitation of Western Europe and East Asia, and later in the developing world without understanding the implications of the American "exceptionalist" ideology.⁵

American exceptionalism has spawned two conflicting doctrines about the relationship of the United States to the rest of the world. One is the liberal doctrine that American experience represents the perfection of political and economic evolution. An extension of this view is that it is the mission of the United States to lead the world, through example and assistance, into a more democratic and prosperous future. The second is the realist doctrine that a virtuous America, prosperous and democratic, exists as "an island of political and economic virtue in a surrounding sea of world corruption" (Noble, p. 13). An extension of this view is that the United States must be continuously on guard against the corrupting influence of reactionary and radical ideology. It must manage its relationships with other countries primarily in the interests of its own security. American assistance policy has shifted back

role

15- 9

and forth in its relative emphasis on these two variants of exceptionalist ideology unimpeded by significant contributions by social scientists to policy generation or evaluation.

One might argue that I have overstated the case against the contribution of social science knowledge to both foreign economic and foreign assistance policy. A critic might point to the contribution of George F. Kennan's memoranda and articles urging a policy of containment.⁶ One can also point to a large body of literature on development assistance policy and impact (Krueger, Michalopoulos and Ruttan, forthcoming). But the commitment to economic and strategic assistance, reflects, in my judgement, deeper ideological roots.

A second example draws more broadly on comparative experience. Stop for a minute and ask, which societies tend to draw most extensively on social science knowledge and in policy design and reform? It seems clear that societies in which the design of social institutions is strongly determined by ideology or religion exhibit a very weak demand for social science knowledge. The USSR, for example, tends to draw primarily on that narrow range of economics most closely related to engineering -- input/output analysis, mathematical programming, and sector modeling. In China, until very recently, much of the capacity of economics was devoted to clarifying the implications of shifts in economic ideology (Calkins, 1984). Relatively little capacity was devoted to institutional design.

It also seems clear that the demand for social science knowledge is strongest in those societies and in those historical periods in which the burdens of ideology, religion, and tradition impose relatively weak constraints on institutional design. And within any society it seems

apparent that the demand for social science knowledge is strongest when the society is attempting to confront the problems of the present rather than when it is attempting to recapture romantic memories of the past or pursuing utopian visions of the future.

In the 1960s it was possible for a brief period to believe that the exhaustion of the ideologies that had dominated social thought for the previous century and a half had permanently shifted the demand for social science knowledge to the right (Bell, 1960, pp. 369-75). But this vision is somewhat more clouded when viewed from the perspective of the 1980s. It is difficult to avoid the conclusion that budget reductions have been used to reduce the accumulation of social science knowledge in order to reduce the challenge to ideology in policy design.

Social Science Knowledge and the Supply of Institutional Innovation

If one accepts the notion that the demand for knowledge in economics, and in the social sciences generally, is derived from the demand for institutional change, it then becomes necessary to consider the sources of supply of institutional change.

The view that emerges from my own work is that advances in social science knowledge act to shift the supply of institutional change to the right. Throughout history, improvements in institutional performance have occurred primarily through the slow accumulation of successful precedent or as a by-product of expertise and experience. Institutional change was traditionally generated through the process of trial and error much in the same manner that technical change was generated prior to the invention of the research university, the agricultural experiment station, or the industrial research laboratory. With the institutionalization of research

role

15-11

in the social sciences it is becoming increasingly possible to substitute social science knowledge and analytical skill for the more expensive process of learning by trial and error.

But how responsive are advances in social science knowledge to demands arising out of social conflict or economic growth? Is the supply of social science knowledge for institutional innovation relatively elastic? Or is society typically faced with a situation wherein the demand for institutional innovation shifts against a relatively inelastic supply curve? Stigler has argued that the supply of knowledge in the social sciences is relatively impervious to the impact of economic events (Stigler 1965, pp. 16-30). He also has argued the opposite position (Stigler, 1982, pp. 63-66). My own perspective is consistent with Stigler's more recent view that social scientists respond rapidly to changes in the economic and political environment. Advances in social science knowledge are becoming an increasingly effective substitute for trial and error in the design and reform of economic institutions and economic policy.

If we accept the arguments that (a) the value society places on social science research is derived primarily from its contribution to institutional change and performance and (b) advances in social science knowledge are responsive to demands generated by social and economic change, we are then forced to consider several additional questions. How much freedom does a society have in choosing the path of institutional change that it will follow? Is society as free to design new institutions as planners frequently assume? Or is institutional change so dominated by historical or evolutionary forces that rational design has relatively little role to play in the process?⁷

The response by economists to these questions can be grouped in two major intellectual traditions. One tradition can be characterized as the design tradition, the other the evolutionary tradition.

The strategy adopted in the design literature is to attempt to distinguish between institutional mechanisms, over which the designer or planner can exercise some degree of analytical control, and institutional environments, in which changes are treated as exogenous (Hurwicz, 1972a, 1972b, 1977; Reiter, 1977). The research agenda is then to study the performance characteristics of different institutional mechanisms under a wide class of institutional environments.

My own work (with Hayami and Binswanger) on induced institutional innovation falls more within the evolutionary tradition. In this work we have attempted to test and examine empirically how changes in the institutional environment have been induced by long-term changes in resource endowments and changes in technology.⁸

The history of the rural social sciences suggests a strong commitment to the design tradition. Agricultural economists have been intimately involved in the process of institutional design almost since the origin of the field. We have been involved both through our research and through personal involvement in the design and reform of land tenure, credit, and marketing institutions. And our leading practitioners have contributed both to the agricultural policy debates and to the design of agricultural policies and programs. The history of our successes and failures suggests that we have been less sensitive to the constraints placed on design by changes in the economic and social environment. And we have often been

insensitive to the design opportunities made possible by changes in resources and cultural endowments or by changes in technology.

In a recent article I reviewed the history of the contribution of agricultural economists to the policy proposals and program design that were in the older literature referred to as the "direct payment" approach and in newer literature as "de-linking" of price and income supports (Ruttan, December 1984). While considerations of space preclude repetition of the review in this paper it may be useful to draw attention to what appears to be the lessons of more than half a century of contribution to institutional design in the field of agricultural policy.

A first lesson is that deficiencies in social science knowledge relevant to institutional design have at times imposed a substantial burden on the design of effective policy. The production control proposals advocated by Department of Agriculture economists in the 1930s, such as Wilson, Ezekiel, and Tolley, reflected the pervasive deficiency in the understanding of macroeconomic relationships. In spite of advances in the understanding of the macroeconomic relationships during the 1940s, it seems apparent that the limited ability to translate that understanding into a system of demand and supply relationships, and to estimate empirically the parameters of commodity and sector models, imposed a severe burden on both the design and the acceptance of the Brannan Plan. for example, except for a few illustrative estimates for individual perishable commodity programs (for hogs, eggs, potatoes, and milk and milk products), Secretary Brannan was not able to present to the Congress overall cost estimates for implementing his proposals.

By the early 1960s the theory and method for the preparation of such estimates had become fully institutionalized in the USDA and were consistently referred to in debates over commodity policy. It had become customary to estimate the farm price and income effects, the consumer price effects, the federal budget impact, and the income distribution impact of the farm policy alternatives that received serious administrative or legislative attention. And I am prepared to argue that these estimates contributed to both the quality of the policy debates and to better policy than would have emerged in the absence of the advances in analytical capacity that occurred over the previous two decades.

A second major lesson that emerges from the cases examined in this paper is that short-run economic and political events can exert a major impact on the effectiveness of social science contributions to institutional design or reform. The depression of the early 1930s generated a dramatic increase in demand for social science knowledge for the design of policies and programs.

But the capacity of social scientists to respond to such opportunities with effective program design is itself dependent on the state of social science knowledge. Roosevelt's election resulted in a discrete shift to the right in the demand for institution innovation. The department economists who contributed to the design of the commodity and price policies of the 1930s were clearly among the most brilliant members of the profession. But the economic theory and economic research on which they were forced to draw for policy design was underdeveloped. The policies that were designed in the 1930s have imposed a continuing burden on

professional dialogue in the field of agricultural policy and heavy social costs on both farmers and consumers.

A third inference is that the agricultural commodity programs were induced by fundamental economic forces associated with the development of the American economy and the agricultural economy in particular. Before the beginning of this century, the gains in productivity in American agriculture were almost entirely a consequence of increased mechanization. The technological revolution of the nineteenth century contributed to increasing output per worker but contributed very little to growth in aggregate output (Hayami and Ruttan, 1971, pp. 138-52). The period immediately after the turn of the century was a period of technological stagnation. But by the mid-1920s a new biological technology capable of enhancing output per acre and output per unit of breeding stock was beginning to come on stream. Gains in total productivity, in output per unit of total input, made it possible to increase aggregate output more rapidly than aggregate demand thus putting downward pressure on agricultural commodity prices.

In the absence of public intervention in agricultural commodity markets, the gains from the new technology would have been transferred almost immediately from agricultural producers to consumers. In this environment it should not have been surprising that farmers would be unsatisfied with policies that protected them only from the effects of cyclical fluctuations in economic activity. Although farmers and farm leaders articulated these demands in different terms, it seems clear in retrospect that they were demanding economic policies that would dampen the transfer of productivity gains from farm producers to consumers.

The role of the rural social scientist -- or the social scientist, whether concerned with the problems of agricultural commodity markets, rural communities, or rural people -- is influenced by the environment in which s/he works. It is both enlarged and constrained by the mission of the organization in which s/he is employed. In the following sections I consider the role of social science research in the agricultural college or university and in the agricultural ministry or department. In an earlier writing I have also discussed the role of the social sciences in the agricultural research institute (Ruttan, 1980; Ruttan, 1982, pp. 308-313).

Social Science Research in the College of Agriculture

The role of the social sciences in an agricultural college or university or in the college of agriculture in a comprehensive state or national university derives directly from the mission of the college itself.⁹ The mission and responsibility of a social science department located in a university setting is much more diverse than a social science unit in an autonomous research institute. It also differs significantly from a social science department located in a college of arts and sciences. At the University of Minnesota, for example, the Department of Agricultural and Applied Economics has responsibility for teaching the undergraduate and graduate applied economics courses dealing with the agricultural economy and rural development. It is responsible for the economics research functions of the Minnesota Agricultural Experiment Station. And it is also responsible for off-campus educational programs in the area of agricultural economics and rural development that are organized through the Extension Service.

role

15- 17

The pattern that I have described for agricultural economics is also characteristic of many rural sociology departments. There is, however, a somewhat greater tendency for rural sociology to be organized as a section in a sociology department than as an independent department. Anthropology departments usually included a relatively high proportion of staff members whose professional interests focus on rural communities. Students of agricultural history, agricultural geography or agricultural politics are often found in College of Liberal Arts (CLA) departments of history, geography or political science. An important implication of the difference in the college of agriculture and college of liberal arts mission is that the social scientist located in a CLA department is likely to feel a primary commitment to a discipline rather than to the mission of the college. It is contributions to the discipline which assure professional mobility and minimize the financial and bureaucratic constraints of the college or the university.

The social scientist with an appointment in a college of agriculture is subject to many of the same constraints and incentives that are operative in a college of arts and sciences. There are, however, additional incentives and constraints which arise from the institutional (state and federal) funding of research and service (extension). Institutional funding of agricultural research has the effect of placing a high priority on research that will contribute to state economic development. Public service activities involving programmed educational efforts are organized through the extension service on a statewide basis. Incentives in the college of agriculture are typically structured to encourage a state or regional orientation of research and extension

efforts. There is, however, always a tension between the incentives and reward structures that are relevant for a college of agriculture and those that are accepted as relevant for those parts of the university which have only limited state support for research and extension teaching programs.

It is also useful to contrast the role of social science research in a college of agriculture with that in a free standing research institute. One major difference stems from the autonomy of academic departments in the university environment. It is much more costly in terms of both physical and intellectual effort, to organize multi-disciplinary research efforts within, say, the University of Minnesota College of Agriculture, than at the International Rice Research Institute. I do not intend to imply that such interdisciplinary efforts do not occur in a university environment. My argument is that the structure of organization and incentives that operate within the university acts to discourage such collaboration. When it does occur, however, it typically takes place within a somewhat looser coordinating structure. It is often organized through a series of interrelated subprojects or other relatively independent contributions.

Even within agricultural economics, research involving group efforts tend to be informal or loosely structured rather than tightly organized. One of the more successful efforts was the series of studies of supply and demand relationships for agricultural commodities organized by the Interregional Committee on Agricultural Policy. A major product of this research effort was the definitive report by George Brandow on Interrelations Among Demand for Farm Products and Implications for Control of Market Supply (1961). The study provided the empirical foundations for

role

15- 19

the estimates of the program impacts of the agricultural commodity programs that were introduced in the 1960s.

A more typical example is the pattern of evolution of research method and collimation of research results that has resulted in the accumulation of a large number of studies of rates of return to agricultural research (Ruttan, 1982, pp. 242-246). The first rate of return estimates for hybrid corn and sorghum were made by Zvi Griliches in his 1956 Ph.D. thesis at the University of Chicago. This initial study was followed by estimates of the rate of return to agricultural research on a sector wide basis in the early 1960s. The work by Griliches was continued by several of his students in the mid and late 1960s. Willis Peterson estimated rates of return to poultry research; Robert Evenson developed new methodology for estimation of rates of return for the U.S. agricultural sector as a whole; and Ardito Barletta estimated rates of return to research on wheat and maize in Mexico. Since the early 1970s there has been a virtual explosion of studies which have further advanced the methodology for estimating rates of return; have covered a number of additional commodities; and have extended the work on rate of return to the agricultural sector by a number of other countries.

In stressing the limitations that the academic environment places on the capacity to focus research effort, even when such effort is organized under the auspices of the agricultural experiment station, one should not lose sight of the factors which make a major research oriented university a highly favorable research location as compared to either a free standing research institute or a ministry of agriculture. Perhaps the most important is the intense interaction that occurs between graduate

role

15- 20

students, junior faculty and senior faculty within the framework of graduate training activities. Graduate teaching forces senior researchers to continuously relate their own work to an expanding range of research issues and methodology. Graduate students are probably more severe critics of the quality of research effort than colleagues. The opportunity does exist, in spite of the constraints suggested above, for productive interaction between basic and applied research (or theoretical and empirical investigations) and across disciplines. The interaction between teaching research and service (or extension) does provide an opportunity for flexible career development. The result is that one rarely finds within the academic environment of a major research university the intellectual stagnation which the Pound Report identified in several of the USDA regional utilization laboratories (National Research Council, 1972).

Social Science in the Ministry of Agriculture

A modern Ministry of Agriculture has three primary functions: (a) the conduct and coordination of agricultural research; (b) the management of agricultural development programs; and (c) the operation of the nation's agricultural commodity and food programs. As a result of these three responsibilities, the Minister of Agriculture together with his support staff, is a central figure in the formulation of agricultural policy. The Secretary's office becomes a central focus for dialogue within the national administration, between the administration and the national legislature, and between the government and the several political constituencies with interests in agricultural development, natural resources, commodity and food policies. In some governments these responsibilities are concentrated in a single ministry. In others they may be fragmented among, for example,

role

15- 21

a Ministry of Natural Resources, a Ministry of Agriculture, and a National Food Board. Within the administration, important coordinating functions are often exercised by a Council of Economic Advisors, a National Planning Commission, a Budget Office or a Ministry of Finance.

The role of social science within a Ministry of Agriculture depends both on historical tradition and the capacity of a particular minister or his senior deputies to utilize social science knowledge. There are, however, essentially two functions involved regardless of tradition or personality. One is a staff function. This involves organizing the information about programs and policies that the Minister needs to interact effectively at the policy level with the rest of the government, with the legislature and with the several agricultural and food constituencies and, in nations in which agricultural trade is important, with other governments. A Ministry of Agriculture which has inadequate staff capacity in the social sciences leaves a Minister naked -- with little clothing to protect himself from shifts in the political winds or social and economic currents.

Social scientists in a Ministry of Agriculture also have a very important analysis and information function. It is important that the dialogue within the government and between the government, the several constituencies and the public be conducted in an environment in which there can be reasonable agreement about the social and economic impact of policy or program alternatives. This permits the dialogue to center on the desirability of the impact rather than to degenerate around arguments of "my facts versus your facts." When I worked as the agricultural economist on the Council of Economic Advisors in the early 1960s, for example, there

role

15- 22

was a very intensive effort made to achieve agreement between the Council, the Bureau of the Budget, and the Staff Economics group in the Department of Agriculture on the commodity production, farm income, consumer price, and the budget implications of the alternative commodity programs that were under consideration. Policy debate could then proceed without disagreement on alternative programs-impacts.

Even under the most favorable circumstances the development of effective social science capacity in a Ministry of Agriculture is not an easy task. Maintaining a high level of capacity over time is even more difficult. in part this stems from the close link between social science analysis and the agricultural policy process. Within a ministry there is no way to avoid considerable tension between the needs of short-run analysis of current policy issues and the development of analytical capacity. Neither is there any way to obscure the political implications of the analysis that is conducted in the ministry. information on regional or personal income distribution or the implications of particular rural development or commodity policies can generate political support or opposition to policies or programs to which the government (or administration) is committed. Even the refinement of a commodity model can enhance the capacity of program managers to administer a commodity program -- and more effective administration may generate gains or losses for producers, middlemen or consumers.

As a result there are typically substantial lacunae in social science staffing. Ministries have typically been more successful in institutionalizing capacity for statistical services and economic analysis than in the other social sciences. As Ministries of Agriculture have

role

15- 23

expanded their concern with rural development, in addition to commodity policies and programs, lack of capacity in anthropology and sociology has often been a serious constraint on effective policy formulation and program design. In the late 1940s the USDA was forced to dismantle its emerging capacity for sociological research on community development because of Congressional dissatisfaction with a series of sociological studies of the adjustment problems in racially segregated rural communities in the south (Hardin, 1955). Continued Congressional opposition has prevented the rebuilding of more effective social science capacity to work in problems of rural development. Even in the case of economics the development and maintenance of capacity in a number of important areas has periodically been jeopardized by controversy over the appropriate role and organization of economics in the USDA.

It seems clear that the continuing tension in ministry or department social science research units between the demand for expansion of analytical capacity; responsiveness to the latent demand for social science knowledge by the social and economic constituencies that are not adequately represented in the political marketplace, such as the rural poor; and the biases in demand for knowledge by politically powerful clientele can not be resolved by the simple expedient of reorganization. In his 1976 Presidential address to the American Agricultural Economics Association, Kenneth R. Farrell, then Deputy Administrator of the USDA Economic Research Service, suggested that one approach to overcoming (a) the parochialism of state experiment station social science research would be to establish an autonomous national food and agricultural policy research institute (Farrell, 1976). He argued that the institute should be funded largely by

role

15- 24

private funds. In my judgment, however, these issues are even more difficult to resolve than suggested by Farrell. Effective demand for social science knowledge in those areas which are not now represented by effective political constituencies is dependent on changes in the structure of economic and political power.

The Demand for Social Science Knowledge -- Again

There are today, few agricultural research programs in which the social science disciplines are not represented. The ability of the social sciences to "colonize" agricultural research institutions has, however, been highly uneven. Agricultural economics is the only field that is fully institutionalized across the broad spectrum of agricultural research institutes, university related agricultural experiment stations, and agricultural ministries.

What account for the limited development of professional capacity in the other social science disciplines in agricultural research institutions? Lester Thurow has argued, in the case of economics, that the "part of the imperial success of economics is due to the fact that the profession has a client relationship with society. Economists have not been generally instrumental in shaping society's agenda, but they have been willing to work on that agenda -- whatever it is (Thurow, 1977).

The social science research agenda, in the field of agricultural development and policy, has clearly been heavily weighted in terms of economic criteria. The other social science disciplines have been more critical than economics of the agenda that society -- often represented by a legislator or a minister picked from one of the more conservative rural constituencies -- has drawn up for social science research. It has been

role

15- 25

exceedingly difficult to resolve the problem of how to respond to the biased demands for social science knowledge that are channeled through existing institutions and at the same time attempt to reform the process by which the existing agenda has been established.

Don Paarlberg (1978), in a series of important papers, has argued that in the United States a new agenda in which community, environmental and equity considerations are more heavily represented has been placed on the agenda. In the 1970s the World Bank, U.S. Agency for International Development, and a number of other international aid agencies attempted to force issues such as integrated rural development and programs designed to meet basic needs higher on the policy agenda in the development programs for which they provide assistance. This resulted, for a short time, in a stronger demand for social science knowledge of the type that psychologists, sociologists, political scientists, anthropologists, and historians are more able than economists to supply. A question that the social science disciplines have never answered effectively is whether they are willing to respond to this rising demand -- or does past alienation from the policy process limit their capacity to respond?

We have suggested in this paper that society is able to realize the gains from investment in social science research capacity to work on problems of agricultural and rural development in terms of more rapid institutional innovation and improved institutional performance. These gains are not realized without substantial cost. The development of social science capacity capable of producing a continuous stream of new knowledge directed to institutional innovation and performance imposes severe stress on a number of institutions. There will be stress within the several

social science disciplines over the allocation of professional resources between attempting to understand basic behavioral relationships and the utilization of social science knowledge to speed innovation and improve performance; there will be stress among the several social science communities and disciplines regarding priorities in expanding professional capacity and over the priorities of disciplinary and multidisciplinary research activities; there will be tension between the social science and the natural science based disciplines and professions over the extent to which each will be guided in its own choice of priorities or by the findings of related disciplines. Finally, the results of the new knowledge that flows from social science research will produce tension between the political system, the broader society which it represents, and the institutions that are responsible for the conduct of social science research -- research institutes, experiment stations, universities, ministries -- over the value, the legitimacy and the implications of the new knowledge that emerges from social science research.

NOTES

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¹This usage is consistent with my earlier work (Binswanger and Ruttan, 1978, pp. 327-57; Ruttan and Hayami), where the term "institution" is used to include that of organization. The term "institutional innovation" will be used to refer to innovations that lead to changes (a) in the behavior of a particular organization, (b) in the relationship between such organization and its environment, or (c) in the rules that govern behavior and relationships in an organization's environment. This definition is more inclusive than Veblen's (Seckler, p. 61) but is consistent with that used by Commons (p. 26) and Knight (p. 51). The definition used here also encompasses the several classes of institutional entities and behavior employed by Davis and North (1971). For a criticism of the definition employed in this paper see Bromley (1987).

²This section and the section on the supply of institutional innovation draws on earlier discussions in Ruttan (December 1984).

³For two initial attempts see Hayami and Peterson and Norton and Schuh (1981b). See also the reviews by Norton and Schuh (1981a, b) and Norton and Norris (1984).

⁴For a very useful review of thought regarding the Progressive Era see Scott. For the intellectual, political, and social origins of many of the reforms of the Progressive Era in the earlier farmer protest movements see Hicks (chap. 15) and Hughes (pp. 96-145).

⁵The ideology of "American exceptionalism" emerged out of the encounter between Puritan theology and the American frontier. The Puritans viewed themselves as a chosen people trapped within the bondage of the European medieval establishment. Their migration from the old England to a new England was interpreted as analogous to the exodus of Israel from Egyptian bondage to the Promised Land. The encounter with the frontier contributed to the secularization of the metaphors of Puritan theology and of freeing American political culture of its bondage to history (Hartz, 1955; Packenham, 1973, Noble, 1985).

⁶The seminal ideas that provided the rationale for the containment policy was first put forward by George F. Kennan in a "long Telegram" written from the U.S. embassy in early 1946. It was rewritten as a memorandum to Navy Secretary James Forrestal in December 1946 under the title "The Soviet Way of Thought and its Effect on Soviet Foreign Policy." It finally appeared in print under the pseudonym X (July, 1947).

⁷This issue has been of concern since the origin of modern social science. In 1744 Giambattista Vico, whose role in the origins of political science is comparable to that of Adam Smith in economic thought, argued that it is "naive to regard political and social institutions as owning their origins to acts of rational planning...motivated either by considerations of enlightened self-interest or by respect for an abstract

role

15- 29

concept of justice..." (Gardiner, p. 10). For a more recent expression of a similar perspective see Hayek (1978).

⁸This perspective was initially outlined in Hayami and Ruttan (1971, pp. 59-61). It is elaborated more fully in Hayami and Ruttan (1985). See also Binswanger and Ruttan (pp. 227-357) and Ruttan and Hayami (1984). The complementarity between the design and induced innovation perspective was explored at a seminar at the University of Minnesota in February, 1983 (Runge). The importance of feedback between experience and design has been emphasized by Johnston and Clark (1982).

⁹The mission of the University of Minnesota Institute of Agriculture - which includes the College of Agriculture, the College of Forestry, the College of Home Economics, the Agricultural Experiment Station and the Cooperative Extension Service -- has been stated as follows:

"The traditional mission of the Institute of Agriculture has been the development and transmission of knowledge in those areas of technical and institutional change which are relevant to advances in agricultural productivity, more effective use of natural resources, and improvement in the quality of life in rural areas--primarily in Minnesota. In recent years this mission has been interpreted more broadly in terms of national and international responsibilities."

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role

15-31

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DESIGNING SOCIAL SCIENCE RESEARCH TO INFORM AGRICULTURAL MARKET REFORMS AND
STRUCTURAL ADJUSTMENTS IN DEVELOPING COUNTRIES

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by

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I. Introduction

The 1980s have witnessed a resurgence of the debate concerning appropriate roles of the state and the private sector in the economic organization of low- and middle-income countries. The debate, often phrased in terms of "structural adjustment," involves four interrelated elements: the role of planning in the economy, the importance of prices as a constraint on production, the rules governing price formation (e.g., the wisdom of using border prices as a guide for domestic prices), and the design of appropriate institutions to handle input and output marketing (for example, the debate about privatizing parastatals.) To the extent that it has involved Western social scientists, the debate has focused most strongly on sub-Saharan Africa, where many of the arguments are reminiscent of the debates that took place in South Asia, particularly India, 20 years earlier.¹ The resurgence of the debate is due to many factors: disillusionment with the performance during the 1960s and 1970s of planning in general and state marketing policies and marketing institutions in particular; recognition of the adverse impact that unfavorable market conditions may have had on the adoption of new technology; economic austerity in the developing countries, which makes continuing subsidization of state marketing enterprises increasingly problematic; the greater openness of the world economy, which makes it increasingly costly for countries to maintain domestic prices that are out of line with international prices (Schuh); and ideological shifts among some of the major donors towards a more pro-market orientation.

The debate has been accompanied by experimentation in a number of countries in changing the roles of market and non-market institutions in guiding resource allocation. In Africa, for example, Senegal, Mali, Somalia, Madagascar, and Zaire have liberalized the marketing of major staple foods, in the process drastically restructuring parastatal agencies, as part of structural adjustment programs (Berg, 1987a). Zambia followed a similar path until May, 1987, when, following food riots, President Kuanda renounced the IMF-sponsored structural adjustment program and returned the country to its prior system of administered pricing, arguing that if the country was to be forced into poverty, at least it

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¹The most significant debate, in terms of the number of people affected, has been in China. This debate, however, has been primarily among the Chinese themselves. There have been other important debates outside of Africa, such as those leading to the liberalization of fertilizer marketing in Bangladesh (Berg, 1987a), of agricultural product and input markets in Ecuador, and to general economic restructuring in Turkey.

would do so under its own policies rather than those of the IMF. Zimbabwe has followed a different path since independence, extending the activities of the state grain marketing board to communal areas previously unserved by this state agency.

The widespread experimentation with market restructuring offers both a challenge and an opportunity for social scientists. The challenge lies in designing research that can inform ongoing reforms so that policies can be based on more than just theory and ideology, with the corollary that when reforms run into problems, they are correctly diagnosed and the programs are redesigned, retaining the positive elements and modifying those that do not work. Without such information, the risk is that when reforms have unintended consequences, policy makers will conclude that the programs are complete failures and go back to the policies that prompted the reforms in the first place. The opportunity for social scientists lies in using these reforms as a quasi-experimental design (Campbell and Stanley) to learn more, both empirically and theoretically, about the process and impact of changing the relationship between the state and the market in economic organization.

This paper elaborates on the challenge and opportunity. The rest of section I discusses the conceptual approach adopted here to viewing the relationship between the state and the market. Section II places recent agricultural reforms in perspective by briefly outlining the evolution of the policies that led to the reforms. Section III then elaborates on the challenges facing social science in designing research to inform these reforms. The paper draws most of its empirical examples from sub-Saharan Africa because Africa has been the focus of many of the recent reforms and because over the past three years I have been involved, along with colleagues at Michigan State University and several African institutions, in studying the interactions between changes in institutions, policies, and technology on food system performance in several African countries.²

Conceptual Approach

In discussing the role of the state in "market interventions" analysts sometimes seem to forget that there are no markets in which the state does not intervene. Without state action to define rules of property, legal tender, norms of acceptable behavior, and the like, the market would not exist (Shaffer, Bromley). If regulation means "to control, to direct, to govern directly and indirectly" (Shaffer, p. 722), then the market is simply one of many forms of regulation, with market outcomes reflecting prior political decisions regarding distribution of rights and resources. Consequently, social scientists should not get caught up in ideological debates about the virtues or shortcomings of "state intervention in markets," but concentrate on what social science can contribute to understanding how, in different country circumstances, responsibilities for various economic activities can be more productively allocated among individual entities and the state. The task is ultimately one of institutional design.

Saying that state involvement is ubiquitous does not mean that all forms of state involvement are equally desirable. Several factors, including the process of economic growth itself, have made previous forms of state action in the

²This research has been financed through the "Food Security in Africa Cooperative Agreement" between USAID and the Department of Agricultural Economics, Michigan State University.

economies of developing countries less tenable. Economic growth involves a transformation from small-scale household-level production to a more specialized, interdependent economy (Reynolds, Johnston and Kilby). In farming, this is reflected in the shifting of input production and output processing and distribution off the farm to specialized entities. One consequence of the growing interdependence of the economy is a phenomenal growth in the number of people, in both urban and rural areas, who depend on the market for their food.³ At the same time, sustained growth in productivity in the food system requires the introduction of new technologies, which places increased demands on the market system to deliver new inputs effectively and help create an environment that encourages their use. The difficulty of organizing the distribution of goods and services purely by a system of command increases exponentially as the number of people and the complexity and affluence of the economy grow.⁴

In addition to the process of structural transformation itself, since the early 1970s several fundamental shifts have occurred in the international economy that have made many previous market policies less tenable. The move to floating exchange rates, the integration of financial and commodity markets, and the increased integration across commodity markets, both domestically and internationally, have resulted in a much more open, dynamic and unstable environment for agricultural markets (Schuh). Policies aimed at influencing domestic agricultural markets can no longer be made in isolation from the rest of the domestic or international economy. One consequence is that it has become increasingly costly for governments to maintain price structures that are divergent from world prices; yet in order to insulate their domestic economies from the increased volatility, many high-income countries have attempted to do just that. Consequently, they have shifted the burden of adjustment to supply and demand shocks onto international markets. The weak financial position of most developing countries precludes them from adopting such a strategy, so they have been forced to try to cope with this volatility. This poses problems both for the day-to-day management of state marketing enterprises and price stabilization schemes and for the planning of long-term investments. A major challenge for these countries has become trying to use their scarce government resources to help develop mechanisms to deal with this risk rather than devoting them entirely to tasks that can be handled by the private sector.

II. Brief Background on Evolution of Marketing Policies in LDCs

Organizations providing marketing services fall into four broad categories: independent private firms; transnational companies; cooperatives; and state agencies, such as marketing boards and parastatals (Abbott, 1987a). During the 1950s and 1960s, many developing countries rejected the option of relying primarily on private firms and transnationals. Reasons for this rejection included the past association of traders and transnationals with colonial or foreign-dominated regimes, a desire to strengthen the economic position of nationals relative to the ethnic minorities that often dominated private trade, and an ideological aversion to markets and merchants. These were reinforced by the perception that the private trade was poorly organized, operated on too small a scale to mobilize the resources needed for development, and could not be counted on to supply agricultural products reliably to key groups in the

³Between 1970 and 2000 the urban population of developing countries is forecast to grow by 1.5 billion, or 250 percent (Mittendorf).

⁴For a good treatment of the difficulties posed by increasing affluence for attempts to direct an economy primarily by central planning, see Balassa.

population, such as the urban poor, bureaucrats, or the military (Bates; Berg, 1968). Consequently, many governments turned to state agencies and cooperatives to handle input and output marketing, often using the cooperatives as agents of the state marketing organizations. The creation of state marketing enterprises frequently occurred through nationalization of former colonial trading agencies.⁵

While in some instances (such as India's Fair Price Shops), the state marketing agencies were explicitly aimed at serving only one segment of the population deemed poorly served by the private trade, in many situations the state granted public agencies legal monopolies on the marketing of particular products. The more limited public marketing efforts have generally aimed at providing improved access to goods or marketing services at subsidized prices, often as a second-best policy when direct income transfers to the target group were administratively or politically impossible. Such schemes have often been moderately successful in reaching these groups at reasonable costs when the target group was narrowly defined and markets were effectively segmented.

Monopoly marketing efforts have had more problems but have generally been more successful for export crops than for food crops. The distribution tasks for export crops are simpler, involving channeling the crop to only a few ports, rather than involving thousands of sales points. There are often significant economies of size in processing and international marketing of the export crops, and an incentive for the agency to sell at the highest possible price, in contrast to the pressures facing a food marketing agency. This has allowed export marketing boards to be self-financing, and indeed, they have often served as important means of rural taxation. In addition, the vertically integrated nature of the parastatal has often fostered the delivery to the farmer of improved production technologies, which were lacking for food crops in many countries, particularly in Africa.⁶

In food marketing, the task has been much more difficult, and unless considerable resources are used to enforce the official monopoly, countries opting for official monopolies have in fact had to deal with dual marketing systems. A major problem then becomes the coordination of the official market with the parallel market, with the cards stacked against the public agency even if it is run efficiently, which in most cases it is not. For example, because the state agency's prices typically fluctuate less than those in the parallel market, in short crop years, when both producer and consumer prices rise, few farmers want to sell to the agency but many consumers want to buy from it. In years of heavy production, just the opposite occurs.⁷ In addition to these sorts of problems, official monopolies for both food crops and agricultural inputs have been plagued by the long litany of management problems typical of public enterprises, particularly in poor countries: late purchases or deliveries, featherbedding, excessive overhead, lack of flexibility, corruption,

⁵In some instances, such as occurred with the French West African cotton transnational (CFDT), components of the organization in individual countries were nationalized but continued to operate as part of the integrated organization. Although the state-owned companies are often referred to as parastatals, they are really part of a jointly owned transnational system.

⁶For a further discussion of why marketing boards face an easier task handling export crops than food crops, see Lele.

⁷See Lele and Candler for further examples.

etc. Bates has argued, however, that the aim of such institutions was never to operate efficiently in the first place; rather, it was to create disequilibria so that the resulting rents could be allocated as political patronage.

Another common practice, often combined with the creation of state marketing agencies, was the maintenance of low official producer prices for major agricultural commodities. Usually, the aim was twofold: the provision of cheap food for favored groups (typically, urbanites) and the extraction of a surplus from agriculture for investment in other sectors. While a low-price policy for agriculture can be maintained without reducing farmers' production incentives if technological innovations are driving down unit costs of production, in many countries the price policy was implemented in the context of stagnant agricultural technology. Therefore, governments sometimes tried to offset the disincentive effects through provision of subsidized inputs.

The pressure for reform grew out of concern for the effects that such policies were having on production incentives, government (and donor) budgets, income distribution, and rent-seeking. Faced with increasing budget costs, slumping export earnings, and reduced aid flows, many countries simply could not sustain their previous policies. This led to the calls for increased reliance on the market, particularly the world market, to guide resource allocation and greater reliance on the private trade to handle the distribution of inputs and outputs. At the same time, there were concerns that relying solely on the market would place the short-term burden of economic adjustment on the shoulders of the poor and of politically powerful groups, such as the military, since most of the proposed reforms, such as devaluation, would lead to substantial short-run increases food prices. Hence, there were calls to tie the market reforms with targeted subsidies in order to spread the burden of adjustment (Timmer, Falcon, and Pearson).

III. Research Challenges

Agricultural market reforms often proceed with very little empirical or theoretical information to guide them. The challenges to social science in helping inform the reforms lie at five levels.

Empirical Testing of the Basic Assumptions Underlying Current or Proposed Reforms

All market reforms are based implicitly or explicitly on a model of how the economy operates. The models arise from theory and ideology, and often policies derived from them are imposed with little testing of the underlying assumptions. Testing these assumptions, however, through case studies of past, current, and proposed reforms, is critical to the design of effective policy. Consider the argument that the maintenance of low official consumer and producer prices for agricultural products acts as a major constraint on economic growth and that states should therefore abandon such prices in favor of import parity prices. (This is the basic argument presented in chapters 4 and 5 of the World Bank's World Development Report 1986.) Implicit in the hypothesis that abandoning official prices will lead to faster economic growth are several subhypotheses, each subject to empirical testing:⁸

1. Changes in official pricing policy taken at the ministerial level actually get translated into new policies at the rural market level.

⁸See Lipton, pp. 201-202, for a similar list.

Evidence from Senegal (Newman, Sow, and Ndoeye), Mali (Dembéle, Dioné, and Staatz), and Madagascar (Berg, 1987b) indicates that in the initial stages of a market reform, government officials in the field often misinterpret ministerial decrees. In Senegal, for example, local officials interpreted a declared floor price as a ceiling price and fined traders who tried to buy at prices above that level. Berg (1987b) reports how parastatals and others formerly favored by previous marketing policies in Madagascar have attempted to create cartels to avoid facing the loss of rents that would result from implementation of the announced policy of paddy market liberalization.

2. **Official prices matter.** If a small proportion of total production enters the market and little of that moves at official prices due to the existence of a parallel market, then changes in official prices are unlikely to have much effect on total production, although they may dramatically affect the relative volumes handled by the official and the parallel markets. In Mali, for example, during the 21 years of official state monopoly over the grain trade (1960-81), only about 15% of coarse grain production ever entered the market, and of this, the parastatal's share varied between 20% and 40% (Humphreys, p. 5). Hence, only 3%-6% of total production moved at official prices. It is unlikely in such a situation that changes in the official producer prices will have much short-run impact on production.
3. **The new prices change farm-level incentives enough to induce farmers to modify their behavior in the desired direction.** Two issues are important here: to what extent do farmers make their production decisions on a commercial basis, and are the changes in price levels large enough to change the relative profitability of different enterprises? To the extent that farmers base their production decisions, particularly for staple crops, on criteria other than profit maximization, the effect of increased farm-gate prices on production will be dampened. Risk is a particularly important consideration here. In semiarid areas where markets are poorly integrated (e.g., in much of Africa), farmers' tendency to give priority to food crop cultivation over cash crops seems to reflect not so much the relative monetary returns to growing different crops as the riskiness of putting one's sustenance at the mercy of unreliable grain markets. Furthermore, even if farmers do make their decisions primarily on a commercial basis, shifting to world parity prices may not change the relative profitability of different enterprises enough to induce the sought-for change in output mix.
4. **Farmers have capacity to respond significantly to the price changes, i.e., farmers have additional resources, new technology, or both, that can be drawn into production.** Although a few cross-country studies of supply response (e.g., Peterson) have argued that the long-run price elasticity of supply for agricultural commodities is high, such studies attribute all cross-country differences in production to price, ignoring the highly complementary effects of technical and institutional factors on farmers' ability to respond to higher prices (Johnson, Krishna).⁹ Country-specific studies report much lower

⁹Defenders of such studies may argue, following Hayami and Ruttan, that new technologies and institutions evolve in response to prices and hence are part of the long-run supply response. For a critique, see Krishna.

supply responses; Scandizzo and Bruce's survey of supply elasticity estimates for major staples in 103 developing countries found that 62% of the long-run elasticities were less than 0.5, and 27% were negative (pp. 72-74). The supply elasticity for aggregate agricultural production is even lower than those for individual crops, as the individual-crop elasticities reflect farmers' ability to shift their crop mix in response to changes in relative prices (Krishna). In many countries, institutional rigidities, such as poorly functioning input and product markets, and lack of improved technology, severely limit farmers' ability to respond to higher prices, particularly in the short run.

5. Increased production, if it is forthcoming, can be effectively marketed. This assumption is critical to sustaining higher farm prices and hence incentives to produce.
6. The increase in agricultural production induced by higher prices leads to faster overall economic growth. This assumes strong linkages between agriculture and the rest of the economy and that an agricultural surplus, if it is generated by higher prices, can be effectively mobilized and productively reinvested, either in agriculture or in other sectors of the economy. This may be problematic due to barriers to the intersectoral transfer of resources (poorly functioning fiscal and financial systems, fixed consumer food prices, etc.) and to barriers to productive investment of those resources (corruption, lack of effective investment planning, and the like).

Similar sets of subhypotheses could be elaborated for theories of how devaluation will stimulate agricultural growth, how changing the relative prices of domestically produced and imported cereals will change consumption patterns, how private traders will respond to changing the rules regarding who may legally participate in the trade, and so on. Obviously, the degree to which each subhypothesis holds true will differ by country and by groups of farmers and consumers within each country. Testing these subhypotheses requires more case studies of both successful and unsuccessful policy reforms to identify which variables were critical in limiting or facilitating the response of food system participants to the changes in the incentive structure engendered by the reforms.

Measuring the Incidence of Market Adjustments and Reforms

One of the greatest political barriers to market reforms and structural adjustments is concern about the distribution of costs and benefits of these actions on different groups of the population. Although theory offers a guide to who will be helped and hurt by changes in food prices (Mellor), policy makers often lack basic data on consumption patterns, degree of market involvement of farmers, access to state marketing institutions, subsidized input distribution, and the like to make informed judgments about the incidence of these reforms. Such information is crucial, however, for any sort of targeting of interventions and for evaluating the tradeoffs among alternative policies. Lacking such information, discussion has often rested at a theoretical level, with some arguing that reforms help all but a small group of rent seekers, and others arguing for the need for "adjustment with a human face" (UN/World Food Council).

The importance of such information for guiding policy can be illustrated with

examples from Mali and Rwanda. In 1985/86 both countries attempted to raise farm-level prices for major staples (coarse grains in Mali and beans in Rwanda) through purchases by state grain boards in order to increase production incentives and rural incomes. Because both countries are characterized by smallholder agriculture, the policy makers assumed that the farming population was fairly homogeneous, with the majority of farmers being net sellers of staples who would benefit from higher prices.¹⁰ Subsequent research showed these assumptions to be wrong. In Mali's two major surplus zones for coarse grains, only 48% of farmers were net sellers these cereals, while 39% were net buyers, even though 1985/86 was a year of record production. Furthermore, 20% of the farmers accounted for 78% of total sales; these were the better equipped farmers, living in higher rainfall areas, who were also the most involved in cotton production and other aspects of the commercial economy (Dioné and Staatz; Dioné). The situation in Rwanda was even more striking, with only 22% of farmers being net sellers of beans, while 72% were net buyers. Furthermore, 7% of farms accounted for 81% of total net sales (SESA/MSU Research Team). Rohrbach reports similar findings among communal farmers in Zimbabwe. Obviously, discussions of price policy in these countries take on a different light in view of these findings.

Similar types of information are needed on the incidence of consumer and producer subsidies that are the target of policy reforms.¹¹ Basic knowledge on the incidence of anticipated and ongoing reforms is essential in anticipating barriers to changing current policies, assessing the cost-effectiveness of alternative policies, and preparing to deal with some of their adverse consequences. The incidence of price policy also affects the degree to which price policy can be effective in shifting production and consumption patterns. To the extent it affects mainly those who do not have capacity to respond due to technological, income, or institutional barriers, aggregate price response will be limited.¹²

Research on the Design of Improved Institutions

Social science research can make critical contributions to the design of institutions to deal effectively with the changing environment discussed in Section I and to foster the fundamental transformation of the economy from small-scale production to a science-based, integrated system with a broad distribution of benefits to the population. In designing such research it is

¹⁰While analysts recognize the adverse impact that higher food prices have on low-income consumers, most continue to assume that in Africa, in contrast to Latin America and South Asia, the vast majority of rural residents are net sellers of food and hence would be helped by higher food prices. For example, in discussing the adverse effects of higher prices on consumers, Lipton (p. 206) states that "It is not a serious risk in most of sub-Saharan Africa, as long as most poor people can farm some land."

¹¹Research spearheaded by scholars at Ohio State University, for example, shows that a high proportion of the benefits of subsidized credit is often captured by elites (Adams, Graham, and Von Pischke).

¹²In Mali, for example, the main technological innovation currently available for increasing coarse grain production is use of animal traction. Yet the farmers most benefited by the price support had already obtained this technology, while the semi-equipped and non-equipped farmers, most of whom were net sellers of food, were hurt by the price policy.

important to avoid falling into the trap of believing that the sole institutional constraint to good performance of the food system is "excessive government involvement" in the market. Good private-sector performance requires substantial government action in providing the public goods necessary for a market to operate (standardized weights and measures, market information, and so on.) Given the extremely constrained budgets of many low-income countries, one of the challenges is to help design low-cost means of providing these services.

Another trap to avoid is the belief that atomistic competition is always the best market structure for fostering technological change in the economy. For the handling of certain type of goods or services, particularly perishables and inputs that embody more sophisticated technologies, larger, more vertically integrated systems may be preferable. In analyzing the design of appropriate institutions, the use of transaction cost economics (TCE) may be a particularly useful tool (Williamson, Johnson). This school of analysis focuses on the design of institutions as a function of the nature of the transaction they are intended to mediate. TCE pays particular attention to problems posed by relying solely on the spot market when asset-specific investments are being made in the context of uncertainty and opportunistic behavior by market agents. This is exactly the situation faced by most countries undergoing a structural transformation of their economies.

Below is a short list of some of the types of social science research needed to help design better marketing institutions:

Improved methods of input delivery. The productivity of certain types of agricultural inputs like fertilizer is not immediately apparent to the purchaser through visual inspection, and the scope for opportunism (e.g., through adulteration) is large. Many of these inputs also require a complement of technical information on their proper use. Research is needed on the efficacy of alternative methods of delivering such inputs, considering, for example, the use of franchising tied with private provision of extension advice, provision through transnationals (e.g., via contract farming), and distribution through farmer cooperatives.

Factors leading to good performance by farmer cooperatives. Many of the recent reforms call for an increased role and autonomy for farmer cooperatives in the marketing of agricultural outputs and inputs. The performance of cooperatives in most developing countries has been dismal, in part because they have often been directed from outside, serving as little more than local agents of the state. Not enough work has been done on what factors contribute to successful cooperatives in LDCs and to which tasks they can contribute the most.

Risk management tools. The traditional risk management tools of farmers in developing countries have been diversification and holding of stocks, while those of state enterprises have been holding stocks and borrowing (accumulation of arrears). Both have high opportunity costs; for example, diversification limits the gains from specialization. As the market environment has become more risky, there is a need to develop mechanisms to deal with that risk. For example, what is the scope for marketing boards and farmer cooperatives to manage risk through the use of international futures and options markets, passing on the benefits to farmers and consumers?

Improved methods for targeting subsidies. Although there is a large discussion in the literature about the need to target subsidies, considerable work remains on how this can be done effectively.

Improved Rules for Using World Prices. Most structural adjustment programs call for countries to price their tradeable goods at import and export parity prices. While in theory the world price represents the opportunity cost of a small country's resources, given the volatility of certain international markets such as those for rice and sugar, it is not always clear what the relevant world price is. Countries that allow transmission of every fluctuation of the world price into their domestic economies may send very confused signals to producers trying to plan long-term investments. Timmer, Falcon, and Pearson call for medium-run (1-2 year) stabilization of the domestic price for staples around the long-term trend in the world price but this leaves unaddressed the problems of determining what the long-term trend is and the operational difficulties poor countries face in running even in short-term price stabilization programs. Social scientists need to help develop workable rules for tying domestic prices to world prices while still maintaining a stable enough set of expectations within the country to encourage warranted investment in the food system.

Many of the ideas for improved institutional designs need to come from observation of what has and has not worked elsewhere. (For an example of this type of approach, see Abbott, 1987b.) This requires improvements in our techniques of comparative institutional analysis. Social scientists need to pay particular attention to designing cross-country studies in a manner that controls for enough variables to allow valid inferences to be made. It is also important to keep in mind that in studying development, particular attention should be paid to success stories. Social scientists studying "the poorest of the poor" sometimes spend all their time studying failures of development, which leads to few insights into how to design successful institutions.

Improving the Theory of Markets and States in the Development Process

A fourth and longer-term challenge to social science is to develop an improved theoretical understanding of the relationships between market changes and economic development. Economists have been rightly criticized for analyzing the issue of market reforms and development too narrowly, often focusing primarily on short-run static efficiency gains rather than the fundamental challenge of growth--how to produce dynamic disequilibria and productively use the rents generated by them. Despite the admonition from Timmer, Falcon, and Pearson that food policy analysts need to consider the full range of constraints facing policy makers, economists have often tended to underrate the political and social barriers to rapid shifts in economic policies. Here, particularly, increased collaboration between political scientists and economists on the process of market reform would be extremely useful. More generally, there is a need for a more integrated social science understanding of the interactions between institutional, technological, and policy changes. As Schuh points out, currently we have partial theories, such as the induced innovation work of Hayami and Ruttan. While that theory stresses the interdependence of technical and institutional change, it sees both as being driven primarily by the market. But the market itself reflects prior institutional decisions regarding the distribution of rights and resources in society, so to say that the market forces can lead to the evolution "efficient" institutions seems strangely circular, as the prices used to judge "efficiency" themselves reflect a prior institutional arrangement.

In developing improved theories of the relationships between markets and development, social scientists need to balance induction with deduction.

Applied rural social scientists have a long tradition of empiricism, while theorists, particularly in economics, have relied primarily on deduction. In studying many of the areas of policy reform, we are hypothesizing about the behavior of individuals within large economic entities, such as parastatals, or about the behavior of the large entities themselves, behavior for which economics has only poorly developed theories (Timmer, pp. 12-16). It is therefore prudent to let empiricism help guide the development of realistic behavioral assumptions.

Implications for the Organization of Social Science Research

Many decision makers involved in agricultural market reforms and structural adjustments view social scientists skeptically, in part because social science is not well-organized to respond to many of the challenges outlined above. Social science tends to be disciplinary, while problems are interdisciplinary, and social science research in developing countries often is not structured in a way that provides timely, policy-relevant results to policy makers in an easily understandable manner.

Several authors have treated the problems of organizing multidisciplinary, problem-oriented research (see, for example, Johnson, 1986), so only a few summary points are made here. The problems lie at three levels. First, in an age of disciplinary specialization, when renaissance people are increasingly rare, there is a danger of multidisciplinary research becoming either a series of separate disciplinary studies carried out in parallel, with little integration; or a study that descends to the lowest common denominator of understanding among the team, ending up being mediocre analysis from the standpoint of each discipline involved. Second, there are considerable obstacles to coordinating multidisciplinary research across research institutions organized on disciplinary lines (Johnson, 1986, chapters 13-14). Third, in such institutions, there may be few professional rewards for such work.

Much of the needed research discussed above is not amenable to study through two-week consultancies. Research on testing the underlying assumptions of the reforms, investigating their incidence, and designing improved institutions requires long-term research, and hence strengthening of social science research capacity within developing countries. This raises several issues.

The first is recurrent costs. Without improved market policies, many poor countries are likely to continue to experience poor economic performance. Yet as long as these countries remain so poor, they will be unable to retain their best-trained social scientists on local salaries to help design improved policies. Donors may have to "bite the bullet" and support some limited recurrent costs of policy analysis units to help get out of this vicious cycle. Innovative models are needed, perhaps involving greater use of locally run consulting firms within the country to help design and analyze policy reforms.

The location of social science research units is a second challenge. Such units need strong enough links with policy makers to make their results felt yet enough insulation from the political process to be able to do objective research. In many countries, social science research is carried out largely in universities, which often have very poor links to policy makers. Planning units do some research, but often in isolation from their academic colleagues. Fostering professional associations, where social scientists from different organizations can exchange views on an unofficial basis may be an important means of strengthening the links between policy making and research. In order

to help facilitate comparative institutional analysis, increased emphasis on national and international research networks is also needed.

The third challenge is to design the research in a way that facilitates rapid analysis and feedback of findings to decision makers. Elaborate reports presented after two years of analysis are often useless to policy makers, as the issues they analyze are frequently out of date. Providing timely analysis and feedback requires very careful attention to research design and data processing. Researchers have to be highly selective in determining which variables to observe, as it is easy to fall into the trap of collecting too much data, which prevents timely analysis. The availability of microcomputers facilitates timely analysis, but only if research objectives are clear and huge data sets are avoided.

In our research in Africa, we have found short working papers, coupled with seminars, to be effective means of diffusing research results to policy makers. This is in many ways similar to policy extension work carried out by land grant universities in the U.S. Where there is little tradition of such work, researchers may initially have to devote considerable attention to "selling" their results, i.e., demonstrating the relevance of the research for policy and thereby building the effective demand for such work. Including staff from the policy agencies in research design and implementation is a particularly effective way of doing this.

This type of applied research and extension involves a lot of nitty-gritty work, including basic description of how the market system works, who has access to subsidies, and so on. Often it is not the stuff of journal articles. To encourage academics to participate in such work, administrators of academic units may need to consider "market reforms" in the incentives facing social scientists.

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THE BUMPERS AMENDMENT: AID AND TRADE ISSUES FOR U.S. AGRICULTURE

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In November 1985, Senator Dale Bumpers first offered an amendment (No. 1129) intended to prohibit the availability of funds for foreign aid activities that would assist the export of agricultural commodities that compete with U.S. exports. Now commonly referred to as the Bumpers Amendment, it became law in May 1986 (U.S. Senate, 1986a, p. 56). In Bumper's words, the act is to "prevent American tax dollars from being used to help foreign countries who are trying to take our export markets," (U.S. Senate, 1986b). Under this law, the U. S. Agency for International Development (AID) is required to suspend research and implementation projects that could enable poor foreign farmers to increase commercial production of commodities (such as meat, maize, or wheat) that are exported from the United States, and also of commodities (such as palm oil) that, while not produced for export in the United States, may substitute for U.S. commodities.

The following paper undertakes a philosophical analysis of the case for and against the Bumpers Amendment. The first section is an analysis of arguments made by Senator Bumpers' constituents in the U. S. farm community that led him to propose the law in the first place. These arguments must be understood as making philosophical claims about the role of U. S. Government in international development, rather than simply as claims expressing the private interests of American farmers. The second section is a brief review of economic analyses intended to show that, contrary to popular belief, development assistance is in the interests of U.S. farm producers. The argument of the third section demonstrates why the pro-development assistance claims of the second section fail to adequately enjoin the anti-development assistance claims of the first. The final section offers a sketch of a more effective argument in favor of aggressive U.S. policy to develop the agriculture of Third World nations.

Public Research for Foreign Competitiveness: The Moral Issue

The Bumpers Amendment reflects a longstanding sentiment among U.S. food and fiber commodity growers. Domestic producers, who have come to rely heavily upon foreign markets for agricultural commodities, have often cast doubt upon the wisdom of USAID programs to increase agricultural productivity in Third World countries (Scobie, 1979; Dalrymple, 1980). This concern grew into a groundswell of public support for a Bumpers-type law after an Aug. 1, 1985 mailing to members of the American Soybean Association (ASA), the soybean producers trade association, pegged U.S. public support for international farm production research at \$341,137,588. The ASA mailing stated that AID's support of agricultural research in developing countries harmed the U.S.' already weakened foreign trade in agricultural commodities, and, hence, the incomes of agricultural producers.¹ AID questions the accuracy of ASA reports, concluding that ASA could have arrived at their figure only by including amounts intended to be expended over a period of several years and by failing to distinguish accounts dedicated to health and nutrition projects from those dedicated to agriculture. Although fairness to AID demands accuracy in reporting programs, the argument made by AID's critics does not depend upon the technical accuracy of ASA figures. This argument can be broken down into two distinct themes. The first is an interest argument asserting that U.S. foreign agricultural assistance programs are in conflict with the interests of U.S. farmers. The second theme is a philosophical argument that the use of public funds to aid foreign producers at the expense of U.S. citizens overreaches USAID budgetary authority. Both of these themes were represented simultaneously in most statements of the criticism, though some individuals undoubtedly gave little thought to anything beyond their own interests. The argument cannot be interpreted as merely an interest argument, however, as the following analysis shows.

1. The Interest Argument.

It is entirely appropriate that U.S. citizens should express their opinions (both in print and through personal communication) to lawmakers and government officials regarding the impact of government actions and programs upon their personal or commercial interests, and it is not only reasonable but necessary for government officials in a democracy to take these expressions of their constituents' individual interests under consideration in the formation of public policy. Public policy is in many instances an attempt to balance competing interests of individuals against one another. The principle that assures everyone of the right to have their own interests considered as this balance is struck is fundamental to democracy in a republic. This very picture of the policy process, however, entails that sometimes governments will inevitably act in ways that are not in the interest of some individuals, since it presumes that there will be occasions on which the competition among individual interests is irreconcilable.

There is, therefore, no general correlation between policies that conflict with individual interests and those that are illegitimate in the sense that they violate principles of ethics and justice. A claim asserting that the policy is unjust (or otherwise morally unacceptable) implies that the policy violates one or more of the moral standards that govern the use of state power. The simple claim that a given policy conflicts with individual interests does not do this, since there may be other interests at stake. These other interests might be regarded by everyone as at least equal to, if not more important than, those interests that are thwarted.

The basic distinction between a simple interest argument and an ethical argument can be illustrated by contrasting the case at hand, use of public funds to support research for foreign producers, with the more common case in which public funds are spent for research on commodities that compete with one another (either on a commodity by commodity or region by region basis) within the domestic agricultural economy. Sugar, for example, is produced from beets in some areas of the United States and from cane in other areas. A sugar beet producer can claim with some accuracy that government funds for research and extension activities in sugar cane help the producers of these products and, thus, harm any competitive advantages that a beet producer might otherwise enjoy. The beet producer might demand to be compensated (through funds expended for research and extension on sugar beets, for example) when such actions are taken. None of this, however, could be construed as a moral claim that government acts illegitimately when it helps cane producers in the Southeast, but rightly and with justice when it helps beet producers in the Great Northwest. Such a claim is so patently ridiculous that even the most ardently partisan supporter of the beet industry could utter it only in jest.

2. The Philosophical Argument.

The corresponding claim (that the government acts rightly and with justice when it helps U.S. producers, but wrongly and illegitimately when it helps foreign commercial growers of the same products) needs to be (and is) made with all seriousness. Producers who criticize AID express an interest argument, to be sure, for they claim that helping foreign growers is contrary to the interests of American farmers; but they also make a moral claim that is philosophically distinct. While the Colorado beet grower who criticizes cane programs in Louisiana is somewhat placated by a policy that provides commensurate support for beets, the Illinois soybean grower would not be at all satisfied to learn that the government spends far more to support development of the Illinois soybean industry than it does to support the soybean industry of Brazil or Argentina. Such a response misses the point.

The point that it misses is one which is absolutely fundamental to social and political philosophy, generally, and is clearest in social contract theories of the state. Since Hobbes

(1651), social contract theories have founded the establishment of government upon an argument claiming that individuals unbound by obligations and constraints of government have, would, or (rationally) should abandon some of the personal liberties that they enjoy in that freedom in exchange for certain guarantees and benefits that can be secured only by enforceable schemes of mutual cooperation. The philosophical basis for the Bumpers' Amendment sentiment can be found in either of two implicit themes of social contract argument. First, it is the standard assumption of contract theory that benefits accrue primarily to contracting parties. Second, although the state's responsibility to protect individuals from foreign threats is ambiguous with regard to economic interests, it cannot plausibly be understood to permit state intervention on behalf of foreign competitors, unless significant state interests are at stake.

With regard to the first point, it almost goes without saying that the greater part of any plausibility that follows from social contract arguments in political theory comes from their analogy to standard sorts of personal contracts in which parties consent to be bound by terms and conditions. The presumption is that parties so agree because they perceive a mutual benefit in making the contract. There may, to be sure, cases where parties contract for services that will benefit others either indirectly, as when the services I contract from a house painter so beautifies my neighborhood that others benefit aesthetically (or even in increased property values. There may also be cases in which others benefit directly as a result of altruistic intentions, as when I contract with the same house painter for services to be rendered to a local charity. These exceptions might be cogent for the point under review if Third world agricultural development were an indirect benefit, or if it were altruistically desired by the parties being required to sacrifice in its behalf. The mere fact that arguments for a Bumpers-type law were made indicates that neither of these conditions obtain. The model of mutual benefit to contracting parties demands that any altruistic motives be explicitly and voluntarily expressed by the parties.

Second, among the most basic of these guarantees is one that assures parties to the contract that the newly created state power will secure their person and property against any foreign threat. This guarantee can be interpreted to entail, at a minimum, that state power may not be actively used to place them at a competitive disadvantage to foreigners.² It is, in fact, somewhat reasonable to expect that state power will be used collectively to gain advantage over non-citizens; although many versions of contract theory would not support this stronger claim. It is not, therefore, unambiguously clear that the state's duty to protect citizen interests extends into the economic realm. It does seem clear is that this duty would entail neutrality, at a minimum; and neutrality would, on the face of it, at least, be all that is required to support the pro-Bumpers philosophical argument. This is not to say, however, that government might not favor a foreign competitor if some vital national interest were at stake. If, for example, national security demands that the mineral production of some foreign state remain or become economically viable (in order, perhaps, to secure a continuing source of supply), one might encounter situations where government initiatives to support this foreign industry would be justified, even if they harmed (in some non-fundamental way) U.S. producers. As such, there is a general type of argument, stressing national interest, that might be raised against the Bumpers-type form of reasoning. Such an argument will in fact, be proposed in the final section, but first it is important to review some of the arguments that have thus far been proposed to counter the kind of argument raised by ASA and its friends against development assistance.

Contrary to the central claim of the ASA criticism of AID, economic theory, as well as the empirical evidence, would suggest that foreign assistance intended to develop Third World agriculture creates an expansion of international markets for commodities exported by the U.S. farm community. The theoretical foundations for this view are argued by Mellor (1972), de Janvry and Sadoulet (1986), Houck (1986), and Rossmillier and Tutwiler (1987). Empirical support has been demonstrated in analyses by Bachman and Paulino (1979), Kellogg, Kodl and Garcia (1986), and Christiansen, (1987). These works are, for the most part, offered as straightforward economic results, not as philosophical arguments. Nevertheless, they form the foundation for a counter-argument made to explicitly counter pro-Bumpers claims in general, and ASA claims in particular. In the following discussion, this sophisticated economic argument will be represented by two simplified versions of it that have appeared in the popular press. These popular versions would be strengthened in some of their theoretical and empirical claims by full documentation, but neither theoretical nor empirical claims will be questioned in the analysis that follows. As such, the popular versions have an advantage over more technically adequate arguments both in their intuitive appeal, and in their clear and intended applicability to the political environment created by the ASA literature and by the Bumpers Amendment itself.

It is this popular version of the sophisticated argument that I shall refer to as the True Interests Argument. It is offered to accomplish two related goals: 1) it is intended to demonstrate that a hidden premise of the ASA criticism of agricultural development assistance is false; and 2) it is intended to erode support for the viewpoint advocated by ASA among the U.S. farm community. After an initial review of the True Interests Argument itself, it will be useful to evaluate the relevance of each of these goals to the two versions of the pro-Bumpers arguments as they have been discussed above.

1. The True Interests of U. S. Agriculture.

The True Interests Argument assumes (quite reasonably) that future increases in demand for basic farm commodities will come primarily from the people of the developing world. The people of the Third World have yet to become large scale consumers of imported commodities. As they gain purchasing power, they promise to expand markets for food and fiber both because of their sheer numbers, and because, as they become more wealthy, they can be expected to make dietary shifts toward meat consumption that will increase per capita consumption of agricultural commodities. Impressive demand growth will not come from a developed world where population and diets have stabilized. Increasing demand from potential Third World customers awaits only economic growth in those societies that would allow them to command commodities in world markets.

But how to achieve economic growth in the developing world? Writing in The Wall Street Journal, Randall B. Purcell answers,

Contrary to conventional wisdom, the best way to achieve this is through the development of local agriculture in the developing countries themselves. Because most Third World workers are employed in agriculture, the development of this sector achieves a more even distribution of income than does the development of other sectors. And in the early and middle stages of economic development, as people have more money, the first thing they spend it on is increasing and diversifying their consumption of food (Purcell, 1987).

Theories of economic development from the 1950's recognized the importance of industrialization in general economic growth, and for this reason stressed the formation of manufacturing capabilities in developing countries. This "conventional wisdom" referred to by Purcell

has been significantly revised as development economists have improved their understanding of agriculture. Investment in capital intensive manufacturing industries created severe political problems in many developing economies. Wealth tended to accrue to relatively small elites, while industrial workers (and the urban poor lured to cities by false expectations of industrial growth) expended a high percentage of their incomes upon basic necessities. Agricultural sectors still organized for plantation production of commodities for export (and subsistence production of commodities for personal use) were unable to meet the food needs of the new urban proletariat. Government attempts to supply urban food needs through imports (sometimes of PL480 donations) depressed markets for endogenously produced food and exacerbated problems in foreign exchange (Todaro, 1985).

It has been suggested that some of these problems might be avoided by revising the assumption that agriculture is relatively unimportant for general economic development. A carefully chosen investment in agriculture should, as Purcell notes, spread capital (and, hence, return on capital) across many more people in the developing economy than does a single large investment in industrial manufacturing. The multiplier effect of increasing incomes throughout the economy is greater when more incomes are increased, even if by relatively smaller amounts. Furthermore, increases in rural income are less likely to be expended upon imported luxury items, thus easing pressures on foreign exchange. Finally, the increased production of food and improved efficiency of farming should release labor for industrialization (thus creating demand for purchased food) at the same time that it increases the supply of basic foods available on commercial markets. Agricultural development does not replace industrial development under such a scenario, but it is seen as of coequal importance in contributing to overall economic growth (Mellor and Johnston, 1984).

In short, agricultural development in the Third World is important for U.S. exports of agricultural commodities because it is a prerequisite for general economic growth, and economic growth in the Third World is, in turn, the best hope for expanding demand for U.S. exports. This argument from economic theory has been advanced as a direct response to the critics of foreign agricultural assistance by G. Edward Schuh, Director of Agriculture for the World Bank. Schuh writes,

It is important to understand where the true interests of U.S. agriculture lie and especially where future U.S. markets are likely to be. ... These markets are likely to grow most rapidly in the developing countries (including China)... [but] only if their economies expand and their living standards rise. ... Increasing productivity and incomes in agriculture is thus the key to raising per capita incomes in the economy as whole. These higher incomes are the source of a strong demand for agricultural imports (Schuh, 1986).

2. Is the Pro-Bumpers Argument True?.

If the True Interests Argument is sound, it provides an important counterweight to one feature of the criticisms directed at USAID. The critical arguments share an assumption that agricultural assistance programs are contrary to the trade interests of American farmers. This assumption is called into question by the closer analysis of the relation between aid and trade given in True Interests Argument. If the claim that development assistance harms the competitiveness of U.S. farmers is false, why take ASA claims seriously, or enact a Bumpers-type law? Two points need to be discussed in response to this question.

First, although the True Interests Argument is quite persuasive when U. S. agriculture is considered in the aggregate and in the long run, it neglects short run consequences that may, indeed, be negative for some sectors of the U.S. farm economy. de Janvry and Sadoulet

(1986) note that effects upon U.S. export markets may even be negative in the short run. Paarlberg (1986) notes that although increased agricultural productivity has led an increase in agricultural imports for some often cited developing countries, counterexamples abound, as well. Peterson (1986) points out that arguments citing aggregated results for the entire U.S. farm economy are unlikely to be persuasive to producers of individual commodities, some of whom face stiff competition from growers in climatically well-suited developing country contexts. It is not appropriate to review the accuracy of True Interests Argument claims in light of such skepticism, but it is worth noting that the key substantive assumptions of the ASA claims cannot be dismissed out of hand.

Second, the short-run/long-run discrepancy noted by these critics is of particular importance given the political context in which the ASA argument was made. If it is philosophically wrong to directly assist the competitors of U.S. producers, the mere fact that this will lead to long term benefits to U.S. producers does not make it right. The producers who are (temporarily) harmed today may be different individuals than the producers who are benefited tomorrow. Given the high rate of farm failures occurring during the years preceding the Bumpers debates in 1985 and 1986, individual farmers would appear to have prima facie justification for rejecting arguments in which individual farm failures would be concealed by aggregate growth in U.S. agriculture.

In conclusion, although the True Interests Argument casts considerable doubt upon the essential claims of the pro-Bumpers case, it is not decisive. Its highly aggregated nature leaves plenty of room for skeptics in the farm community to doubt that foreign agricultural development will benefit them. U.S. agriculture as a whole may benefit, but in an era of rapidly evolving farm structure, many individuals may question whether they (or their heirs) would be involved in U. S. agriculture long enough to reap the rewards.

3. Should the Pro-Bumpers Case Be Made?

The previous discussion indicates that many individual producers may still feel strongly motivated to press the central claim of the ASA mailings in letters and petitions to Congressional leaders. It should also be noted that, even if the factual claims of the True Interests Argument are correct, they have far more relevance to the interest version of a pro-Bumpers position than to the more sophisticated (and more persuasive) philosophical claim. It is certainly true that, once convinced that foreign aid serves his interest, a U.S. farmer will have little personal interest in opposing it through a Bumpers-type law. As a philosophical claim, however, the case is different. If it is wrong for government to help foreign competitors, the mere fact that there are indirect benefits for U.S. citizens does not make it right. Indeed, there would almost always be some domestic beneficiaries to any case of helping foreign competitors. The injunction against this sort of activity is stated on principle and is not mitigated by the fact that some people who thought they might be hurt are, in fact, helped. The plausibility of the pro-Bumpers case depends upon two very basic assumptions of social contract theory. An argument overturning that principled philosophical case must attack it either at the level of the founding principles, or by showing that some overriding social good is more important for this case. Simply showing that the people who offered the argument may have harmed themselves by having done so counts for nothing; as a philosophical argument, it did not matter who made the argument, but only its logical force. This point will become clearer in the following section.

Why the True Interests Argument Fails to Address the Philosophical Case

In this section, the distinction between the interest argument and the philosophical

argument for a Bumpers-type law is discussed a second time in the context of a familiar philosophical distinction between presumptive and discretionary goods. The main point, addressed in the second section below, is to show that the main philosophical claims behind ASA criticisms of AID depend involve presumptive goods, while the True Interests Argument presumes that the issue is merely a dispute over discretionary goods. This distinction points the way for the conclusion of this analysis, an argument sketch for a strong case for development assistance.

1. Presumptive and Discretionary Goods.

The dual nature of the U.S. farm community's case against international agricultural development can be clarified by noting a standard distinction between presumptive and discretionary goods in social and political philosophy.³ It is generally recognized that the benefits citizens enjoy from government services are of two kinds. Discretionary goods are benefits that may be enjoyed and desired by a majority (or even unanimously) by citizens, and which are provided solely because they are desired and supported by a majority of citizens. If tastes or opinions change, the government would not only be justified in discontinuing its support of discretionary goods, but would be mandated by public opinion to do so. Among the frequent examples of discretionary goods are parks, roads, museums, and public arts projects. Presumptive goods, on the other hand, are benefits, services, or guarantees that necessarily must be provided for just continuance of the state. If a government fails to provide presumptive goods, it not only may weaken itself, it calls its legitimacy into question. National defense and protection of basic rights to life and liberty are among the standard examples of presumptive goods.

The line between a discretionary and a presumptive good is neither unambiguous nor noncontroversial. While some of the paradigm examples cited above may seem clearly discretionary or presumptive, many government actions might be described by their advocates as securing presumptive goods, and decried by their critics as providing only discretionary (and, indeed, unwanted) goods. The classic debate has been over welfare benefits. Liberals have seen the redistribution of wealth to secure minimums of welfare and opportunity to all citizens as a presumptive good, one required both to stabilize society and to guarantee human rights required for the legitimation of government (Nagel, 1977; Levin, 1981). Conservatives and libertarians have disputed the presumptive character of welfare benefits, arguing that the state is founded instead upon minimal protection of security, liberty, and property claims of individuals, and that active state welfare programs would be justified only to the extent that individuals support them through voluntary contributions (Nozick, 1974). As such, the conservative view not only makes welfare benefits discretionary, in founding them on the willingness of citizens to contribute, but also finds the unilateral use of tax dollars to support welfare programs to be a coercive violation of property rights (and, hence, a governmental failure to provide a presumptive good) (Klosko, 1987).

Although the details of this classic disagreement over discretionary and presumptive goods are not directly relevant to the issue at hand, it is important to see why the philosophical debate turns upon whether welfare benefits are presumptive goods. Although government may provide many discretionary goods to its citizens who want and support them, when the provision of a discretionary good conflicts with government's ability to secure presumptive goods, it is the presumptive goods that must prevail. Presumptive goods "trump" discretionary goods because they are essential to the just foundations of the state. They prevail without regard to the preferences or opinions of the majority, and, indeed, provide the philosophical basis for protection of minorities against the tyranny of a majority view. This is not to say that presumptive goods are always finally decisive in determining policy, since two or more presumptive goods may be not mutually satisfiable, too. In such a case, one is forced back to

fundamental philosophical goals in the establishment and legitimation of the state in any attempt to set priorities or fashion a compromise.

2. Presumptive Goods and the True Interests Argument.

The distinction between presumptive and discretionary goods sheds light on the "True Interests" argument. Advocates of this view address the U.S. farm community with evidence intended to show that their initial presumption of conflict between their trade interests and AID's development assistance policies is false. In fact, the True Interests Argument states, U.S. farmers should join in support of these policies; it is in their commercial interests to do so. In making this type of claim, the True Interests Argument treats AID development goals as if they were an attempt to secure discretionary goods, goods that are justified simply because Americans want them and are willing to support them. The attempt to build political support for these goals implies that they are appropriate actions for AID only to the extent that they are endorsed by American citizens in the political process.

The philosophical argument against agricultural development aid, however, claimed that these policies were in conflict with presumptive goods. The philosophical argument against depends upon seeing AID's actions as beyond the scope of governmental activities sanctioned by the implicit terms of a social contract, at a minimum, and as most probably in conflict with the presumed purposes of state power. As such, the mere fact that the farm community might be shifted from the column of those opposing a discretionary good to those supporting it carries little philosophical weight. The number of people supporting the discretionary good against the presumptive one is irrelevant; the claim to violate a presumptive good "trumps" all discretionary arguments.

Toward a Rehabilitation of AID's International Development Goals

The distinction between presumptive and discretionary goods also indicates the strategy that a philosophically adequate response to AID's critics must take. Such an argument must not place much importance upon discretionary benefits that AID's policies might return to members of the U.S. public. Such benefits will never override the presumptive character of the ASA argument. Instead, a reply to the philosophical version of the ASA argument must demonstrate that AID's efforts at international agricultural development itself attempts to secure presumptive goods, goods that the U.S. Government is, as a matter of justice or national interest, required to pursue.

It is not possible to present a full account of how such a claim might be established here. The purpose of this paper is, in part, to indicate areas in which further research is needed, however, so the incompleteness of the argument can be regarded as a virtue rather than a deficiency. In this vein, the concluding remarks which follow are intended as a sketch of how such an argument might go, although it is acknowledged that there are important gaps in the account of it that is given here. In addition to this sketch, I shall point out several topics that are in particular need of multi-disciplinary research for any resolution to the general issues raised by discussion of the Bumpers Amendment.

1. International Agricultural Development Aid as a Presumptive Good: An Argument Sketch.

The True Interests Argument has two deficiencies that have been noted above. First, an empirical deficiency is found in its highly aggregated and time dependent portrayal of benefits to U.S. agriculture. Critics of the argument question whether particular individuals could reasonably be expected to receive any of the benefits alleged to flow from development assistance, at least within the time frame in which such benefits would be of the most value

to them. The second deficiency of the True Interests Argument is that in portraying the outcomes of AID's development programs in terms of discretionary goods to benefit U.S. producers, the argument fails to address the fundamental philosophical objection, namely that these programs aim to supply competitive benefits to foreign nationals. These two deficiencies notwithstanding, the True Interests Argument makes a convincing case for the thesis that foreign agricultural assistance is beneficial to national interests, and to the U.S. economy as a whole. If this aspect of the True Interests argument is emphasized, rather than its appeal to individual farm producers, it might be restructured in a way that would allow it to form the basis for showing how these development activities help the government secure a presumptive good, rather than a discretionary one.

In a recent book, The Rise of the Trading State, political scientist Richard Rosecrance argues that the balance of geo-political power and prestige has shifted in the last century (and particularly in the last twenty five years) from those nations with dominant military strength to those nations with the most cultivated and extensive networks of trade. Rosecrance's thesis, in part, is that national interest cannot be defined exclusively or even primarily in terms of armed might and military alliances. Increasingly, it is the ability of a nation to enter mutually beneficial trade relations with other countries that determines the parameters of national interest (Rosecrance, 1986). If Rosecrance is right, then healthy, non-domineering trade relations cultivated with developing countries through helping in the growth of their agricultural sector may play a greater role in U.S. national interest over the long run than does the more celebrated and discussed supply of arms and military support. If national interest hangs, in an important way, upon these economic and cultural relations, there is good reason to think that it is a presumptive good being sought by these development goals, rather than a discretionary one.

The argument as presented thus far is hypothetical. An adequate presentation of it would require far more analysis of the adequacy of Rosecrance's thesis, its broader implications, and the links that might be made between aid, trade, and an enlightened view of national interest. Even if the empirical and conceptual links could be established, one would still need to show that the presumptive goods secured by aid were philosophically more fundamental than the presumptive constraint upon aiding foreign nationals. Nevertheless, these tasks seem achievable, and once completed, might provide a firmer philosophical foundation for international development activities, generally, and not just in agriculture. The research needed to round out this perspective is considerable, and it is therefore important to turn, in closing, to some of the priority needs.

2. Research Needs.

In identifying areas for more research, it may be useful to start with some of the most obvious needs for data collection and analysis. The empirical claims of the True Interests Argument are a case in point. There is a need for more data, and more empirical analysis to determine the scope and validity of the claim that international agricultural development helps U.S. agriculture. This research should address not only the broad aggregate relationships mentioned in the popular arguments given by Schuh and Purcell, but should also involve country by country, and commodity by commodity study of impact upon three groups of affected parties: developing country producers (including the rural community), developing country consumers, and U.S. producers. In light of the long term goals of linking the True Interests Argument with a broader view of national interest, empirical research on development should also be sensitive to a broad view of the political aims and effects of trade.

There is also a fairly obvious need for research on the central thesis proposed in Rosecrance's book, and in particular with regard to how a trade-based theory of national

interest and geopolitics has implications for agriculture and development. This is a fairly open-ended research need, with applications in many disciplines, most assuredly including economics, political science, and philosophy. Even apart from Rosecrance's thesis, there is a clear need for both speculative and empirical research on the cords that bind trade, development, poverty, and political power.

More specifically on the level of political philosophy, there is a need for research on the philosophical foundations of development policy, generally. The argument presented here would place the emphasis upon the concepts of presumptive and discretionary goods, and where a nation's development assistance policy would fall with respect to this distinction. A popular view may be to see international aid as a form of charity, something that a wealthy and developed nation should do, but not essential to the fundamental aims of the state. Such a view would seem to place AID policy within the category of discretionary goods, but if the argument sketched above has any force, that categorization needs to be rethought. The concepts of discretionary and presumptive goods must themselves be analyzed more carefully, and must be more carefully integrated into economic development theory where, to my knowledge, they have not been widely applied.

In connection with philosophical research, it should be noted that other philosophers have seen promise in a strategy other than the one outlined above. If development assistance is to be defined as a presumptive good, it must involve either justice or national interest. The strategy chosen above stresses national interest, but perhaps the goals of development assistance are demanded by justice. Although there are reasons to be skeptical of this strategy, it has been pursued in books by Henry Shue (1980) and James W. Nickel (1987), in papers by Charles Beitz, (1975), Thomas Nagel (1977), and William Aiken (1977), as well as in popular books such as Food First or Ill Fares the Land. It is not appropriate to initiate a critical discussion of this literature here, but it is important to note that philosophical research demands an environment of healthy criticism and debate among opposing points of view. As such, it is important to continue this research stream, to determine where it leads, and to encourage debate over the philosophical goals of the development process.

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NOTES

1. For confirmation, see John Baize, "Farmers must fight for world market share," Pennsylvania Farmer, Sept. 14, 1985, 48. Baize is an ASA executive based in Washington, D.C.; also, "World Bank Loans Stir Ire of U. S. Farm Groups," The New York Times, June 5, 1987, p. A9.
2. It is worth noting that this second point would quite probably be endorsed even by those political philosophers, following Hume or Burke, see little cogency to a social contract argument. This view might be (over)simplified as holding that, although the use of state power is not justified by consent, as the social contract theorist would have it, the state is nevertheless useful, and its existence helps the law-abiding citizen prosper and flourish. The limits on state power would be derived more from tradition, or common practice than from the terms of an implied contract. Although it is always somewhat speculative to assert how a traditionalist might argue, it is plausible to think that the state's traditional duty to protect its citizens in the international arena would preclude exactly the sort of actions that the Bumpers Amendment constrains.
3. A distinction between discretionary or presumptive goods (or duties) is implicit in traditional theorists such as Locke (1690), who recognizes in Chapters IX and XI of the Second Treatise that government has both ends and self-generated requirements that are prerequisites to the existence of a just state, but also notes in Chapter XIV that governments may provide services (for the public good) that are not required by the duties of justice. The distinction (but not the terminology) has become standard in political theory at least since John Rawls (1971) based much of his argument in A Theory of Justice on the distribution of what he called primary goods (e.g. presumptive goods).

FOOD SECURITY AND ITS RELATIONSHIP TO TECHNOLOGY, INSTITUTIONS, POLICIES AND HUMAN CAPITAL

BY

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Food insecurity has plagued the world for centuries. Yet not until the time of the 1974 World Food Conference, when poor world harvests and rapidly growing demand evoked the specter of mass starvation, did the concept of food security gain prominence among researchers and policy makers. Shaped by international events at the time, food security was largely defined in terms of: 1) increased food production, and 2) increased national and international food reserves. In sharp contrast, there are currently ample world food supplies, depressed prices and chronic over-production in North America and the European Community, not to mention relatively high carryover stocks in selected developing nations. But the number of hungry people in the world is estimated to have grown by over 10 percent since the early 1970's (World Food Council, 1987a).

The failure of increased world food production to reduce hunger has led to considerable effort to carefully define the concept of food security. The objective of this paper is to discuss the dimensions of food security and their relationship to key aspects of technology, institutions, policies and human capital. We conclude with a priority social science research agenda to improve understanding of how to promote food security, especially in Africa.

Notwithstanding hunger and poverty problems in almost all nations of the world, this paper focuses on food security in Sub-Saharan Africa for two principal reasons. First, food insecurity in Africa appears particularly intractable; this is the only continent where the undernourished as a percentage of total population has not fallen since 1970 (World Food Council, 1987a). Second, along with colleagues at Michigan State University and in various African institutions we have spent the past three years conducting food security research, and will use selected empirical results as illustrations.

I. DEFINITION AND DIMENSIONS OF FOOD SECURITY

The starting point for research on food security is agreeing on its definition (Eicher, 1986). Since 1974, its essential elements have evolved into: availability of food and ability to acquire it (Siamwalla and Valdes, 1980; World Bank, 1986; Eicher and Staats, 1985). We define food security as a situation in which all individuals in a population possess the resources to assure access to enough food for an active and healthy life.

This definition highlights three critical dimensions. First, the emphasis on access stresses that food security is a matter of effective demand as well as supply. It has become increasingly apparent that the world's chronically undernourished lack the resources either to grow enough food for themselves or to generate sufficient income to purchase it. Hence, food security has a supply-demand dimension:

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Supply: assuring that the food system provides, at reasonable cost, a food supply (domestic production, stocks, imports, aid) sufficient to meet the nutritional needs of the total population;

Demand: assuring all elements of the population the purchasing power (from farm and non-farm income, subsidized prices, etc.) for a nutritionally adequate diet.

Sufficiency of supply should be defined not only with respect to the volume of food but also with respect to its cost. The fact that in some countries, supply of certain crops has expanded only at great cost to the national budget or to consumers, emphasizes the need to develop an appropriate mix of domestic production, price and trade policies to meet food security objectives.

Moreover, attention must focus not only on the aggregate supply of food but also on who has the resources to produce it. For example, price and macro policies designed to increase the aggregate supply of food may have limited effects on food security if additional output comes from a narrow segment of well-equipped farmers. Higher food prices may actually exacerbate food insecurity for a large segment of rural farm families who are net purchasers of food and who lack the productive resources or access to inputs to expand production. The incidence of supply expansion may be as important as the rate of supply expansion.

The demand dimension of food security relates to Sen's (1981) concept of "entitlement," or the ability of households to transform their productive resources into food or the income to obtain it. Unless rapid population growth in most African countries is accompanied by income growth, food needs may rise without increases in entitlement. Furthermore, income growth may not improve entitlements for all people. Food and income transfers for vulnerable groups may also be important; if targeted effectively, they raise the real income of the poor, and thus their entitlement to food.

Food security also has an important time dimension:

Chronic: Ability to increase and sustain food supplies and effective demand over the long-run.

Transitory: Ability to sustain adequate food consumption during temporary food price rises and/or income shortfalls.

Chronic food insecurity in most African countries largely reflects the low productivity of the food system. Low labor and land productivity affect both the supply dimension through depressed food availability, and the demand dimension through low surplus marketings and cash incomes that are unable to stimulate demand for farm and nonfarm goods and services. Lacking the demand stimulus to exert upward pressure on prices, production incentives and economic growth may be caught in a low-level equilibrium trap in which neither incomes nor productivity can increase (Mellor and Johnston). In this context, food security requires disequilibrium induced by changes in institutions, technology and knowledge to raise resource productivity and incomes on a broad-based

level. These factors determine the extent to which the poor can transform their resources into food through production or income earning activities.

Because the poor typically spend over half of their disposable income on food, fluctuations in food prices can greatly affect their real incomes and consumption. For low-income countries dependent on food imports, vulnerable groups' access to food is jeopardized by international food price swings and shortfalls in national foreign exchange earnings, as well as domestic production shortfalls (Huddleston et al). Although food and income transfers will continue to be used to fulfill emergency needs, an important task for food security policy is to develop financially viable mechanisms that alleviate short-run food insecurity without sacrificing long-run objectives. Conversely, transitory food insecurity may be the outcome not only of short-run shocks per se, but of longstanding policies and institutions that work against broad-based income generation and weaken the ability of an economy to cope with exogenous disturbances.

A third dimension of food security is level of aggregation: national, household, or individual. Food insecurity is usually associated with particular groups: food-deficit farmers with too little land, given their present technology, to produce enough food, cash crops, or other income to support the family; underemployed low-wage rural and urban laborers; rural small-scale entrepreneurs facing declining demand for their goods when agricultural incomes drop due to poor harvests; agro-pastoralists living in marginally productive areas. Because wealthier segments of a society tend to adjust their consumption relatively little in response to short-run production shortfalls, the burden of adjustment to a crisis falls largely on the poor.¹ Even with national economic growth, selected groups may be unable to participate in the expansion around them. Large segments of the rural population in marginal sectors (e.g. dryland millet producers) may be unable to shift their resources into growth sectors with specific capital, knowledge, or climatic requirements. For these reasons, food security research must be addressed at both the household and national levels.

Food insecurity can also differ greatly within households. Targeted interventions such as maternal and baby clinics often cannot reach malnourished children too old to qualify for support. The work of nutritionists and health planners indicates the importance of food security research on the intra-household level.

¹ For example, a recent study by Shapouri, Dommen and Rosen (1986) indicates that "if the upper 30 percent of the population were able to avoid adjusting consumption during a food emergency, a shortfall of only 5 percent in aggregate would translate into a 20 percent decline in already low availability in the lower 30 percent of the income distribution" (Christensen, 1987, p. 71). A similar analysis of Indian data by Mellor concludes that "it is clear...that it is essentially impossible to protect the poor from the major income effects of a short crop by market measures" (1978, p.149). See also World Bank, 1986.

Defining the hunger problem in terms of food security stresses its three dimensions: time, level of aggregation, and supply/demand. Unfortunately, food security has often been equated with food self-sufficiency or agricultural development, which does little to clarify its meaning. Many countries have expressed their goal of food self-sufficiency. But what does food self-sufficiency imply when a country is exporting food while millions of its inhabitants are malnourished due to lack of effective demand? The case of India and to a lesser degree a number of African countries, illustrates that food self-sufficiency can be associated with a low level of food security.

Food security also differs from agricultural development. The former emphasizes identifying who the food insecure are, and how to promote their access to food, in addition to how to stimulate agricultural productivity and growth. Even in rural regions, attention to income generation quickly moves the scope of analysis beyond the agricultural sector.² Because the primary demand for rural non-farm goods and services stems from the agricultural sector in most developing regions, however, food security may in part depend on increased agricultural growth (Mellor, 1976; Johnston and Kilby, 1975).

The various dimensions of food security are illustrated in the left-hand side of Figure 1. Important indicators of each dimension are contained within the boxes. The indicators are, in turn, fundamentally influenced by the "prime movers" shown in the right-hand side of the figure: technology, institutions, policies, and human capital. In the following section, we discuss the links between these prime movers and the various dimensions of food security.

II. PRIME MOVERS OF FOOD SECURITY AND THEIR INTERRELATIONSHIPS

Since the majority of the poor in Africa are engaged in subsistence food production, a direct means to enhance their real incomes and food access is to increase the productivity of their staple food production (Eicher and Staatz). Hence, technical change--relevant to the environmental conditions of farmers--is a primary starting point to promote food security (Mellor and Gavian). Yet viable technology is not sufficient to increase smallholder productivity. The ability of farmers to move to new production frontiers through input-intensive production systems depends critically on viable input and product markets. Coordination mechanisms within the marketing system shape the monetary and non-monetary costs, demand, and hence prices of inputs and commodities. Thus, output price and cost of production, the variables used to determine farm incentives, have a number of underlying institutional determinants.

In the long-run, human capital investments may be the most important determinant of food security. One need not search far to find examples of this

² A survey of employment data in Africa, Asia, and South America indicates that rural non-farm activities provide primary or secondary employment for 30-50 percent of the rural labor force in developing nations (Chuta and Liedholm). Non-farm employment appears to account for over 20 percent of total cash income of rural households. The importance of non-farm employment in achieving food security is even more obvious in urban areas.

FIGURE 1. FOOD SECURITY: DIMENSIONS, INDICATORS AND PRIME MOVERS

DIMENSIONS OF FOOD SECURITY

CHRONIC DIMENSIONS	
SUPPLY: ABILITY TO INCREASE PRODUCTION AND IMPORTS FOR CONSUMPTION	DEMAND: ABILITY TO INCREASE REAL INCOME FROM FARM AND NON-FARM ACTIVITIES
(INDICATORS)	(INDICATORS)
1. Factor Availability and Productivity	1. Factor Access and Productivity
2. Price and Marketing Incentives	2. Level of Costs and Prices Received
3. Ability to Shift Composition of Production as Consumption Patterns Change	3. Reliability of/Access to Input and Product Markets
4. Commercial Food Imports	4. Non-Farm Employment
	5. Level of National Foreign Exchange Earnings to Finance Food Imports
TRANSITORY DIMENSIONS	
SUPPLY: ABILITY TO SUSTAIN FOOD SUPPLY FOR CONSUMPTION IN EXTREME YEARS	DEMAND: ABILITY TO SUSTAIN ADEQUATE PURCHASING POWER DURING PERIODIC SHORTFALLS IN REAL CASH INCOME
(INDICATORS)	(INDICATORS)
1. Household Food Reserves	1. Variability of Consumer Food Prices
2. National Food Reserves and Stock Management	2. Variability of Household Income (Farm and Non-Farm)
3. Physical Distribution Infrastructure	3. Access to Food and Income Transfers
4. Commercial and Concessionary Food Imports	4. Variability in National Foreign Exchange Earnings

FOOD SECURITY PRIME MOVERS*

TECHNOLOGY
<ul style="list-style-type: none"> - Biological Technology - Agronomic Productivity Increasing Technology - Storage/Processing/Marketing Technology - Irrigation Technology
POLICIES
<ul style="list-style-type: none"> - Domestic Macro/Trade Policies - Foreign Macro/Trade/Commodity Policies - Domestic Stockholding Policies - Domestic Price and Marketing Policies - Domestic Research and Development Policies
INSTITUTIONS
<ul style="list-style-type: none"> - Stability of Political Institutions - Public/Private/Input/Credit/Product Market Institutions - Agricultural Research and Extension System - Physical Infrastructure - Early Warning Emergency Food Distribution Systems - Economic Data Collection and Analysis Systems
HUMAN CAPITAL
<ul style="list-style-type: none"> - Agricultural Research/Development Capabilities - Farmers/Business Managers/Scientists/Administrators Education



*Bio/Physical Capital is considered exogenous at any point in time. It is increased or decreased through time by action of the prime movers.

in the United States.³ Unfortunately, Africa's stock of trained administrators, technicians, and entrepreneurs required to innovate out of low-level equilibria is alarmingly low. Many national research services do not have the scientific capacity to screen or borrow technology from neighboring countries or the world scientific community. The stock of human capital in scientific fields in Africa in 1980 was about one-fourth the relative scientific strength of Asia in 1970 (Shapiro, 1985). And because of limited incentives and rewards for returning to many local agencies, a vicious cycle can result in which the more training professionals obtain, the higher the probability that they will be bid away by foreign institutions. The institutional challenge is to create an environment that gives incentives to simultaneously train and retain a critical mass of local technical and administrative capacity. Unfortunately, investments in human capital, as with technology and institutional development, have mainly long-term payoffs and will require a substantial gestation period (Eicher, 1985).

Economic policies directly affect all aspects of food security through their impact on the level and variability of prices and incentives. And with greater global interdependence, food availability and effective demand in developing areas are increasingly influenced by foreign economic policies (Schuh, 1986). Many industrialized countries insulate their own domestic farm economies from price instability via price supports, effectively venting instability onto world markets. This subjects countries still open to world market forces to even greater price volatility, encouraging them to pursue internal stabilization and self-sufficiency as well. Hence price instability and domestic self-interest combine to create a "tragedy of the commons" social trap, in which the world market becomes more thin and unstable as more countries insulate themselves. But because of the high treasury costs of stabilization/ self-sufficiency policies, developing nations are less able to uphold them. Food security policy is increasingly dependent on research clarifying the effects of developed country macroeconomic, trade, and commodity policies on prices, income growth and stability in LDCs.

The effectiveness of any particular prime mover to promote food security depends on the degree and timing of development among the others. While the importance of productivity-increasing technology has been universally stressed, the origin of productivity is often poorly understood. Bonnen observes that "increased agricultural productivity is commonly explained solely in terms of technological change. Technology in turn is often seen as the exclusive product of research and development. Both notions are erroneous" (1982, p. 1). A new maize variety--an ostensible product of technology--has many things embodied within it: prior human capital investments, institutions, past policies and basic research. In a dynamic, evolving system, these prime movers "interact in a continuing process of innovation in one factor followed by the managed adaptation of the other factors to find a new, more efficient equilibrium of resource use" (Bonnen, p. 4). In short, technology is a product

³ For instance, the contributions of farm management to improved allocative and technical efficiency in production (Bonnen, 1982; see also Griliches, 1964, and Evenson, 1981).

of prior institutional organization and human development, just as these are products of technology.

The relationship between the adoption of on-shelf technology, institutions, and policies is also strong. The rate of return to investments in new technology depends not only on input-output response rates but also on the prices and transaction costs of obtaining and selling inputs and commodities. Hence, concomitant improvements in marketing institutions and policies are generally required to stimulate use of otherwise viable technology. Conversely, evidence is beginning to emerge that a conducive policy environment, while necessary, is not sufficient to greatly stimulate food security in Africa.⁴ How a change in price or macroeconomic policy affects the food security of vulnerable groups depends on their access to additional inputs, the reliability of product markets, available technology, the price effects of market-wide resource reallocations, and the returns to other employment activities. The gap between expectations, and actual results of several current experiments with market liberalization in Africa reflects a lack of knowledge regarding the effects of broad macroeconomic policy changes on the micro behavior of various groups, especially the most food insecure.

III. EXAMPLES OF PRIME MOVERS AND THEIR INTERRELATIONSHIPS IN AFFECTING FOOD SECURITY

In this section we draw on selected results of research conducted with various African institutions under USAID-supported Bilateral Projects and a "Food Security in Africa" Cooperative Agreement at Michigan State University.

Zimbabwe. Poverty and malnutrition appear endemic among Zimbabwe's rural areas (World Bank, 1983). Prior to independence in 1980, smallholder farming in Zimbabwe was generally characterized by low productivity and slow growth: production of maize, smallholders' principal farm enterprise, was stagnant. By 1985, smallholder maize production had more than tripled, yields had roughly doubled, contributions to national production had risen above 50 percent and maize sales had increased to over one-third of total market transactions (Rohrbach, p. 256).

Is this a food security success story, and if so why? Rohrbach attributes the causes of maize output expansion to five important and interrelated factors (p. 258). First, the ending of the independence war allowed smallholders to both replant abandoned holdings and to establish new ones. Second, the research and extension service had developed commercial maize hybrids that would work under smallholder conditions. Third, both public and private sector marketing system improvements converted the potential of proven technologies into the reality of rapid growth in smallholder seed and fertilizer purchases, and output sales. Fourth, a modest but reasonably effective production credit program resulted in

⁴ The empirical record on food grain supply response in Africa and Asia reveals the multivaried constraints on food production and marketing systems in developing countries. Scandizzo and Bruce (1980) report that of 103 studies in developing countries, 71 percent had short-run estimates below +0.5. In the long run, 62 percent were below +0.5.

10 percent of smallholders receiving credit by 1985. Fifth, maize prices were sharply increased in 1980 and 1981.

What are the effects of these production increases on household food security in Zimbabwe? Estimates are that in good rainfall years, the top 10 percent of smallholders, largely concentrated in the nation's high potential (rainfall) regions, are responsible for over 50 percent of all smallholder production and 75 percent of market sales (p. 268). Overall, the majority of smallholders who live in the semi-arid areas and face frequent or constant production shortfalls have benefited least, if any, although Rohrbach believes there is evidence that consumption among most poorer maize households has likely not declined, which could easily have been the case without the aggregate gains in maize production and market sales. Unfortunately the research has also found that improved technology appropriate for crops in low rainfall regions is basically not available (p. 275). And findings are that twenty to forty percent of most households' estimated total income (including the value of farm perquisites) comes from sources other than crop production, such as livestock, remittances and other non-farm activities. While this income is absolutely essential to the food security of poorer households, it is frequently not adequate (especially in drought years) and the Government must mount food aid programs to address transitory food insecurity, as they did in 1987.

Mali. Dione and colleagues carefully examined the effect on food security of climate, institutional support for cash crops and level of ownership/use of animal traction equipment. They find that for households that are semi- or non-equipped with animal traction, their own grain production is rarely enough to assure adequate food access. Income generating activities from cash crops, livestock, artisanal activities, small trade, non-farm wages and remittances were also important sources of entitlement used to purchase supplemental grain needs. Their findings likewise reveal the critical relationship between entitlements, food crops and cash crops. The households that produce cotton are more likely to have animal traction, have access to credit and technical inputs, use these inputs, and as a result produce more cereals (both in total and on a per-capita basis) for own consumption and sale (Dione and Staatz, p. 9).

Other results indicate how two important macro policies have affected household food security in unanticipated ways. First the government raised support prices for coarse grains to create an incentive to expand output. The assumptions were that farmers make their cereal production decisions primarily based on commercial considerations; that if prices increased, farmers had the capacity and willingness to expand production; and more fundamentally that all farmers were net sellers of grain and hence, raising prices would raise rural incomes. Empirical findings question all of these assumptions. Only 48 percent of the farms studied were selling any coarse grains at all, and 25 percent of the whole sample was selling over 80 percent of grain sold. This fact alone tends to concentrate the benefits of price increases, not to mention the adverse effect of inducing higher market prices for the 30-40 percent of rural households who must purchase some of their cereal consumption needs (Dione and Staatz, p. 9). And it was mostly the well equipped farmers in the cotton producing areas that had the capacity, the technology and the inputs available to respond to the high prices.

Even more disruptive of household food security is the government head tax policy (a fixed amount per adults of 18-60 years). In both 1986 and 1987 the head tax accounted for 90 percent of all direct rural taxes, and total taxes paid by farmers amounted to 13 to 20 percent of the total value of coarse grain production, depending on the producing area. Farm households that sell cotton or have other sources of cash income have little difficulty paying these taxes, even though they are collected during grain harvest season. Farmers who are able, prefer storing grain until later in the season when prices rise. In contrast, in zones where cash crop production opportunities are low, most farmers are forced to sell grain to pay taxes even if they have no real surplus, and must use any alternative source of income to buy back grain throughout the year for their own consumption. The real food deficit of these households is compounded by an additional deficit imposed by taxes (Dione, p. 3). Even more disruptive to long-run food security is the effect of this tax on disinvestment in traction equipment and draught animals, thereby reducing the productive capacity of the household. In the non-cotton growing zone studied, 65 percent of the equipped and semi-equipped farmers have experienced disinvestment, and the majority identify the head tax as a major cause (Ibid). This case clearly illustrates the importance of interaction between policy and technology in influencing food security.

Rwanda. Rwanda has the distinction of being the most densely populated country in Africa and one of the highest per-capita consumers of dry beans. Since grazing area is shrinking, beans have become an increasingly important source of protein for the rural population. In 1986 the government attempted to expand production incentives by raising prices significantly above market levels in Rwanda and bordering countries of Zaire, Uganda and Tanzania. Loveridge, with researchers in the Ministry of Agriculture, found that informal imports from these neighboring countries make up an unanticipated 60 percent of the total volume of beans in the national market. If actually implemented, the relatively high floor price would benefit mostly foreign producers, as well as the 11 percent of Rwandan farmers who produce 92 percent of marketed surplus. At the same time the higher floor price would have also raised consumer prices in rural as well as urban markets, and hurt the 72 percent of rural households that were found to be net bean buyers (SESA/MSU). Especially affected would have been the 30 percent of rural households purchasing about one half of their available supply. And these households indicate that land area, soil fertility and fertilizer access (given existing technology) are their main constraints to expanding output, rather than low prices.

The Rwanda results reiterate the importance to food security of cash crops and other forms of entitlement, along with own food crop production. Households purchasing the most beans report being almost three times more dependent on coffee and tea income to finance food and other household purchases than are the farms selling the most beans. Balanced increases in productivity of food and high value cash crops are critical, especially for the most land-poor and food-deficit households in Rwanda.

In summary, these country examples illustrate that food and hunger problems, viewed in terms of food security, focus on identifying who the vulnerable groups are, how they relate to food and labor markets, what factors impede

their ability to grow more food or raise cash incomes, and how they adjust to natural crises and changes in policies, institutions and technology. Without this knowledge, there can be little ability to understand the constraints to food security, or to design strategies to achieve it.

IV. RESEARCH AGENDA

The most general lesson learned since the 1974 World Food Conference is that food security generally includes, but must go beyond, the technical question of increasing per capita food availability. As stressed by current definitions of food security, the major objective is increased food access. Yet this does not elicit a clear plan of remedial action. Three interrelated knowledge gaps are discussed below: (1) how to operationalize food security research and policy analysis, (2) the appropriate balance between short-run and long-run food security strategies, and (3) the dynamic interactions among the prime movers and their disaggregated effects on incentives and welfare. In the context of sub-Saharan Africa, research on these issues should be pursued on a national basis within a regional framework (e.g., Sahel, Eastern Africa, Southern Africa) thus accounting for significant resource and structural differences (Eicher, 1986).

Operationalizing Food Security. To be meaningful, the concept of food security must be operationalized in such a way that it informs and guides policy. Multidisciplinary social science research is needed to develop an appropriate set of measurable indicators of food security. Such a list would provide operational benchmarks to evaluate the effects of changes in technology, institutions, policies, and human capital on the various dimensions of food security. A set of appropriate indicators would also provide a more explicit and systematic guide for policy analysis. Inevitably, the list will be modified as our understanding, objectives and resources change. Relevant indicators might include some of those listed in the left-hand side of Figure 1. An important choice criterion is that the indicators be measurable at relatively low cost.

Balancing Short-Run and Long-Run Objectives: Multiple dimensions imply competing objectives. Scarce resources allocated to relieve transitory food insecurity (e.g. relief and welfare programs) may have a high opportunity cost if they come at the expense of long-run solutions. On the other hand, interventions with complementary effects on short-run and long-run food security are stressed by Reutlinger.

Hence, research is needed on the appropriate allocation of resources to address chronic and transitory problems. Ultimately, the issue is one of political choice: to what extent is society willing to forego future benefits to alleviate malnutrition now? But effective food security research can inform the policy choice by specifying the trade-offs and complementarities, and stressing the sober fact that good food security policy, in a world of scarce resources, means choosing not to do a wide range of tactically attractive things.

Greater attention to institutional design may facilitate the development of cost-effective food aid and income targeting mechanisms with complementary

effects on long-run food security. An important research task is to design feasible short run measures that sustain health and human capital development, reduce urban migration, and attack the underlying causes of food insecurity as well as its symptoms.

Dynamic Interactions Among the Prime Movers: Food security--its level and incidence--are determined by the functioning of a complex, interrelated system of food, input, employment, and international markets. Many of the behavioral relationships, the dynamic interaction effects, and technical input-output coefficients are poorly understood (Johnston and Clark). Food security policymaking requires better knowledge of the type, magnitude and incidence of change resulting from these dynamic interactions between the prime movers. A starting point for the systematic accumulation of knowledge about the role of the prime movers could be a "cataloging system" within which past and current development experiences can be conceived, analyzed, and compared (Johnston and Clark). Such a catalog of comparative case studies, similar to recent work by Morris and Adelman, would facilitate understanding of how different configurations of the prime movers might interact, given particular resource bases and relations to the international economy, to produce different effects on food security. While realizing that knowledge is ephemeral, policy analysts could draw from this inventory to make appropriate comparisons between their development problems and what has been effective in the past.

The payoffs to such a cataloging system, however, are dependent on concomitant advances in deductive research. Knowing what data to collect for the catalog system, what indicators to examine, requires a model, implicit or explicit, of how an economy works. Theory informs research and policy; past experience improves theory. Work on induced technical and institutional innovation, while still in its early stages, is moving toward defining relationships between variables that ultimately may improve our understanding of the dynamic interactions between the prime movers and food security.

A beginning list of priority issues to be addressed in this process of accumulating systematic knowledge includes:

1. Micro-level research that clarifies knowledge about vulnerable groups: who are they, what do they consume, what factors constrain their ability to transform their resources into food, income, nutrition and health, and how do they adjust to natural crises and changes in technology, institutions, and policies?
2. What food and cash crop technology components are needed in Africa, and what does this imply for technological, institutional and human capital development? While creating new bio- and agronomic technology per-se is in the realm of technical sciences, social science research is critically needed to identify (a) the characteristics that viable technology must possess to be compatible with farmers' resources, risk attitudes, food security and other goals and (b) institutional and policy changes needed to facilitate the adoption of otherwise viable technology.
3. How do rural industry and farm sectors interact? How can coordinated investments in human capital, institutions, and technology best exploit

multiplier effects between these sectors, thereby stimulating effective demand in rural and urban areas?

4. Current experimentation with market liberalization in Africa reveals that simply dismantling inefficient parastatals will not assure the development of a vibrant private trading sector. In many cases neither markets nor government coordination perform very well. The existence of market failure does not mean that a bureaucratic solution exists, nor does bureaucratic failure mean that private sector offers a better alternative. Social science research must identify key constraints in the private system, so that when the political coalition for reform is achieved, appropriate public programs and policies can be implemented that are capable of promoting desired private sector performance.

5. Many countries in Africa have announced goals of domestic food self-sufficiency, although cost implications to consumers (especially the food insecure) and national budgets are significant, if not prohibitive. Research is needed on the micro and macro implications of pursuing food self-sufficiency versus self-reliance strategies that balance the costs and risks of obtaining food from domestic and international sources.

6. What are the effects of border pricing strategies on rural incentives and incomes in a second-best world of artificially low and unstable international food prices due to policies of major grain exporters? Are there alternative institutional mechanisms and policies that can mitigate dislocations and food insecurity caused by market instability without incurring severe budget losses? To inform price policy adjustments, disaggregated information is needed on how specific macro policies and institutional changes affect the micro decisions and welfare of various groups, especially the food insecure.⁵

7. What is the role of food aid and/or insurance mechanisms to address transitory food insecurity, especially under fragmented market conditions or where private traders hold a significant share of total grain stocks?

8. Improved strategies are needed to develop greater human capital in Africa, especially management, research, and policy analysis capacity. While governments are often motivated by short-run interests, training and research investments have mainly long-run payoffs. What is needed to raise both supply and effective demand for research and policy analysis capabilities?

9. What role does population growth play in the food security equation in Africa? Why is there so little debate in Africa today on population and family planning, let alone on generating political support for measures to reduce the average number of children from seven to five per family (Eicher, 1985)?

⁵ A recent comparative analysis of the impacts of structural adjustment on food security in developing countries reports that "relative income distribution has become more skewed and that, in some cases, the highest-income groups have gained in both absolute and relative terms, while considerable losses have occurred among the poor" (WFC, 1987b, p.1). However, it is not altogether clear whether these trends reflect lagged results of the economic recessions that led to adjustment, or to the adjustments themselves.

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RURAL CHALLENGES FOR THE SOCIAL SCIENCES

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We are here to discover the priorities that should guide, not only social scientists, but the politicians and administrators who allocate resources to activities that address the problems of agriculture and rural society. We are here to identify the rural challenges for the social sciences.

These challenges are not just in research. We must identify the high priority activities of social scientists and humanists that contribute to their capacity to create the knowledge needed to address the problems of agriculture and rural society. In generating these priorities we must keep in focus, besides research, data base development, teaching and informal educational activities such as extension, consulting, advising and other types of professional involvement, both internationally and domestically. It is not sufficient to say that research must be done on some topic, when we do not have the necessary human capital. Similarly, certain types of consulting and problem solving may not be possible before the private sector or government or the university invests in developing the appropriate knowledge base.

These priorities are of critical importance today because the changing agenda of problems in agriculture and rural society now fall with much greater frequency into the domains of the social sciences and some humanities than in the past. These problems will not be resolved, or in some cases even addressed, if the appropriate social sciences and humanities are not present and involved.

To achieve this, we need to do more than embalm our perceived wisdom and priorities in a book. We need to develop a conscious strategy that addresses both funding and administrative needs and obstacles. We have a crosscut group in this Workshop that will be developing a strategy for the implementation of the priorities we develop. The next, or third phase of SSAAP will follow through on the strategy.

This is not the first effort to establish various social science priorities. Other groups have made, or are now making, efforts to bring into focus various areas of important social science priorities. The North Central Regional Committee NCT 146, on Social Science Research Priorities ran a workshop on social science priorities in January that Dean Barbara Stowe will briefly summarize at lunch for us. This involved rural sociology, home economics and agricultural economics priorities. Also lunch today Wayne Swegle of Winrock International will talk to us about a colloquium they organized

*I am indebted to Glenn L. Johnson and Larry J. Connor for many useful critical comments and ideas.

last month to bring the priorities for future U.S. development assistance into a better focus. Jim Hildreth will give us a brief overview of an agricultural economics workshop on priorities run by the AAEA two years ago. There have been other efforts materials from which have been distributed to relevant work group leaders. We need to take advantage of these efforts, if we are to do a thoughtful, first-rate job.

Indeed, one may ask why are these efforts not sufficient? The answer is that the scope of what is necessary is large, larger than any individual discipline or agricultural social science field, or any combination of three or four. This Workshop attempts the unique and difficult task of bringing together not only the rural social sciences, but the basic social science disciplines plus philosophers and historians from the humanities. In addition, representative agricultural and rural users of social science knowledge, farmers, businessmen and others, minority participants in agricultural institutions as well as critics of the conventional wisdom of the agricultural professions and of agriculture will join in the debate here. We have tried to get the relevant voices present, although not always with the balance we had hoped for, that are central to the intellectual and policy debates that seem relevant to the future of agriculture and rural society. It should be a worthwhile and exciting workshop.

The New Rural Agenda

This current agenda of issues in agriculture and a rising criticism of the impacts of science suggest strongly that inadequate investment has been devoted to social science and humanistic inquiry in agriculture and rural life. Successful biological and physical science-based technological growth in this century has created great productivity plus unanticipated and undesired side effects -- which economists call externalities. The flow of new technology has not been matched by adequate investments in the necessary complements, that is, in the institutional and human capacities necessary to use and control these technologies effectively. We now face needs for technology assessment, new institutional innovations and related human capital, and research on ethics and values. The latter two especially are primary domains of the social sciences and humanities, for which we have failed to provide adequately.

We are grappling with the largest financial crisis in agriculture since the Great Depression, complex and as yet poorly understood national and international macroeconomic impacts on agriculture and rural communities, and the impacts of national deregulation (in finance and banking, energy, and transportation) on agricultural and rural community welfare and on property rights. Globalization of agricultural markets and growing international economic and political interdependence have created a new policy context and severely constrained national policy options. We face international issues ranging from protectionism and an immense trade deficit to the impact of obsolescent international monetary institutions on exchange rates and market stability. Indeed, the excess capacity, retaliatory protectionism and competition in export subsidies have turned the agricultural policy crises of individual industrial nations into a single, world wide international trade crisis -- which is now beyond the reach of the policy actions of any nation acting alone. Only international cooperation and the creation of new international institutions hold much promise. These problems all fall primarily in the domain of the social sciences. The agenda goes on.

The institutional structure supporting science in agriculture, and for society generally, is in transition to some new configuration with almost no research on the issues involved -- such as alternative research-funding systems, or the means for interlinkage and coordination of the various R&D actors and users.¹ U.S. science policy is in disarray and contest. Except in agriculture and medicine, U.S. science policy has

been shaped to support basic science and national defense. It is now being asked to sustain national economic development (Bonnen 1986a). The new genetic technologies are beginning to change the way agricultural science is funded and managed and is raising new issues in property rights to genetic material as well as to processes for genetic manipulation.

The nation's farm policy is obsolescent but continues without the political will to constrain either its costs or the chronic excess capacity that gave it rise. The issue of the structure of agriculture must be faced, including the future social performance of a farming and agribusiness sector that will be much more highly concentrated and vertically integrated. The fragility of the ecosystem and related environmental issues cry out for new institutions and policies. Problems of rural community decline and development accumulate, largely untended (Barkley). Information age technologies are changing the way we receive, process, store, and use information not only in farm and agribusiness decision making but in rural government and business. Near real time interactions and consequences are changing our problems and social options (Dillman, Bonnen 1986b). Adapting agricultural and rural social institutions and policies to these and other new technologies presents a substantial research and education challenge to the social sciences. As a consequence of the rising economic value of time, issues in human capital formation have become more important determinants of local community and national welfare. In the past most human capital has been formed in the family. But increasing disorder and instability in the American family suggest a reduced future capacity for human capital formation. Social and economic issues surrounding the family and its institutional substitutes are increasingly urgent problems in both rural and urban America.

These are issues that must be addressed seriously, if we are to meet society's expectations and needs. This requires more than the expertise of any one social science discipline; sociology, political science, economic and legal research is necessary. Geography, social psychology, cultural anthropology and social work research are clearly needed. As for the humanities, the lack of any systematic historical perspective disorders the views of policymakers and analysts. You cannot understand current institutional disorders, if you do not understand their origins and the long term forces at work. The history of the development of agriculture and its institutions needs to be researched and taught to agricultural professionals. The growing set of ethical issues and value related problems in rural, especially agricultural, policy and in science require philosophic attention both in research and teaching. The involvement of social science and agricultural professionals in world trade, aid and development as well as service in various kinds of international institutions and forums, requires a far better command of foreign languages and cultures than a typical college education now provides in the U.S.

In the 19th Century, rural public policy was focused on institution building in rural society, agriculture and science. In the last two-thirds of the 20th Century this broad focus has been narrowed to creating technologies and to the adaptation of that technology to ecological and social systems in agriculture, and to policies that create specific financial benefits for farmers. Today the agenda of rural problems is dominated

¹By the term "institution" I mean the rules of behavior, roles and organizations that govern the way individuals and groups relate to each other in society. This, of course, includes the public agencies, private firms, families and other decision making entities of society and the policies they pursue.

by the consequences of obsolescent and failed institutions (including policies) that need modification or replacement and by the need for new institutions.

The response of most institutions with agricultural and rural responsibilities to the changed nature of the agenda of problems they face has so far been "more of the same" -- i.e., primarily an expansion of old programs and a search for new technologies. When the only tool one has is a hammer, all the world's problems look like nails. A technological fixation pervades society. The need for social science and humanistic knowledge has grown, but funding and organized support has not. Why?

Barriers to the Creation of Social Science Knowledge

Most agricultural leadership is trained in the biological and physical sciences. Their imaginations do not tell them when some of their problems can be addressed by social science capability. Unless social scientists help them, they either respond with something based on biological and physical technologies or fall back on a belief that physical and biological science cannot address such problems. Some are actively biased against the social sciences, viewing them as non-sciences and unobjective. A number are sympathetic and do understand the social sciences reasonably well; from these I hear expressions of frustration over their inability to get effective performance from social scientists. They speak of rural sociology and agricultural economics and human ecology: those fields that are directly organized as part of the land grant system. "What amazes me", one of them said, "is that many social scientists seem to have little sense of social relevance, do not talk to anyone outside their specialty and resist working with other disciplines on problems." Another was of the opinion that, if social scientists could not "get their stuff together" any better than they have in the face of the obvious need for greater social science input, it was doubtful they would ever play a role of equal importance with the biological and physical sciences in agriculture and rural affairs.

As Pogo once observed "We have met the enemy and they is us." Most of our difficulties cannot be blamed on insensitive biological science administrators. If the social sciences are not understood, that is primarily our fault. Compared to the biological and physical sciences we do not provide many good success stories for agricultural administrators. This allows the biological and physical sciences to claim credit for all of the increased productivity and improved human welfare in agriculture -- a demonstrably erroneous claim, as is the public R&D institution habit of claiming all increased agricultural productivity for their input, ignoring the private sector.

There is a lack of understanding among administrators of social science methodology and research methods. Indeed, we are being judged, quite inappropriately, by biological and physical science methods. Compared to the biological and physical sciences there is a lack of organization in the experiment stations and elsewhere for mobilizing the social sciences, assessing and explaining social science capability and priorities. There is as a consequence a lack of provision of financial resources for the social sciences in the high priority funding goals in agriculture, even where the social sciences are obviously relevant and needed. Underfunded, lacking college level leadership, poorly connected to the biological and physical sciences, and left to its own direction, the social sciences often fail to provide much relevant research product.

We celebrated the centennial of the Michigan Agricultural Experiment Station on February 25 with a day long series of seminars on the future of science, agriculture and the university. Three of the five biological scientists on the program plus a futurist, Joel Barker, all called for greater social science input. We now have a window of opportunity. But it will pass us by, if we do not exert ourselves. That is why we are

here. We need a better grasp of what the social sciences have to offer in addressing society's important problems, what the most urgent problems are, and what it will require for us to be effective. We must tell the social science story better. We need to do it aggressively. We need to "get our stuff together."

Role and Responsibilities of the Social Sciences

What then is the role of the social scientist? The social sciences deal with individual and societal behaviors, understanding those behaviors and what changes them, managing its direction in some cases, and adapting to it in others. We are concerned with the capacity of the individual, groups and society to form and achieve goals. We try to understand the forces that alter our capacity to do this. I include the pursuit of conscious goals such as growth and increased social or individual capacity and productivity.

What are the primary forces creating change in individual or societal capacity? Greater (or less) capacity can arise out of modifications in technology, in institutions, in human capital as well as changes in available biological and physical capital (whether caused by human decisions or by nature). With respect to these four driving forces one may hold two very different kinds of knowledge. There is positive or (relatively) value free knowledge. In addition there is normative or value knowledge. Changes will occur in society whenever the content of these human data banks change, that is, when either our beliefs about values change or when our beliefs about our value-free facts changes. Since all four of these driving forces are complements in use, no single one can be used effectively except in combination with one or more of the others (Johnson 1986, Bonnen 1987).

Since it deals with social processes, valuation and decision making, social science tends to address broader, more integrative and directly socially relevant issues than the other sciences. As a consequence, the social sciences may not be as reductionist in methods and philosophy. Thus, one responsibility of the social sciences in agriculture and rural society is to ask the "right" questions -- about purpose, the impacts of science, technology and institutions, and how the complex pieces in any social purpose "do" or "should" go together.

Domains of the Disciplines

The responsibility of any single discipline is two fold. It is responsible to the discipline itself for improving its explanatory and predictive power. It is also responsible to society for helping with and sustaining the capacity for multidisciplinary subject matter and problem solving work, not only in research, but extension, advising, consulting, administering, etc. I am aware that in some disciplinary circles this latter assertion is heresy, but listen to the Harvard philosopher, Alfred North Whitehead, on the subject:

In the process of learning there should be present, in some sense or other, a subordinate activity of application. In fact, the applications are part of the knowledge. For the very meaning of things known is wrapped up in the relationships beyond themselves. Thus, unapplied knowledge is knowledge shorn of its meaning. Careful shielding of the university from the activities of the world around is the best way to chill interest and to defeat progress.

And I would add, to reduce the relevance and social value of knowledge.

The social sciences have primary responsibility for value and value free knowledge about institutions. The biological and physical sciences contribute only modestly to any understanding of institutions, so this is primarily the domain of the social sciences and the humanities. The biological and physical sciences have primary responsibility for knowledge about technology. We share with the biological and physical sciences and humanities responsibility for knowledge about the building of human capabilities (i.e. human capital). Primary responsibility for the adaptation of any of the four prime movers to change in any of the others (to achieve some specific social goal) is shared broadly, but a significant proportion falls within the domain of the social sciences. In addition, the social sciences share with the humanities, especially philosophy and history, the primary responsibility for understanding and dealing with the consequences of any changes in the value structures of society. In short, many different disciplines and actors must collaborate if society's goals are to be achieved.

These shared responsibilities of the different disciplines are highly complementary. That is, if you do research in one discipline on a subject but fail to complement it with work in the other disciplines that share that domain you are very likely to fail in problem definition, analysis, and prescription in many policy contexts. Thus, there are broad opportunities for cooperation between the social, physical and biological sciences and the humanities. Indeed, there is an imperative for cooperation. We are not doing well in meeting this challenge at present.

The Continuum of Knowledge

We share a continuum of different kinds of knowledge stretching from knowledge used for problem solving through subject matter knowledge to disciplinary knowledge. Problem solving knowledge is multidisciplinary in nature. It is knowledge that is useful to a single decisionmaker (or a set of decisionmakers) with a specific problem. In the university problem solving is invariably multidisciplinary, that is, you cannot organize properly for problem solving without drawing on more than one department. It also can involve more than one college. Subject matter knowledge is also multidisciplinary in nature, but it is knowledge that is useful to a set of decisionmakers facing a common set of problems. It too usually presents a multidisciplinary challenge, although if your academic unit is a subject matter organization as professional schools, agriculture college departments and institutes tend to be, you may have the needed disciplines in that one unit. Disciplinary knowledge is constituted of the theory, empirical measurements and measurement techniques and methods used to explain the fundamental class of phenomenon of concern to a discipline such as physics, sociology, or philosophy. This type of knowledge does not solve problems directly, instead it increases the capacity of a discipline. In turn the disciplines are necessary for sustaining subject matter and problem solving knowledge. This includes research on values in the social science disciplines and the humanities (Johnson 1986).

Subject Matter Domains and Responsibilities

When you organize to do research you are faced with different categories of knowledge. Some of these are of short lived relevance while others are far more stable or long lived. In other words it is more difficult to organize around some types of knowledge than others. Relatively stable subject matters in the rural social sciences include rural sociology, agricultural economics, home economics or human ecology, resource economics, agricultural history and agricultural politics. There are other examples but these will do. In some cases departments get organized around a relatively stable subject matter such as rural sociology or agricultural economics. There are, of course, other multidisciplinary subject matters in the biological and physical sciences

such as agronomy, animal husbandry, horticulture, forestry and agricultural engineering that are quite stable over time and around which departments are organized. Administratively less stable are many of the subjects on which research is done within some of these departments: for example, energy, farming systems, biotechnology, environmental quality, food chain contamination, food security, community development, international agricultural development and agricultural ethics are topics that will have varying relevance at different times and also varying contents as issues change and knowledge changes. These are not completely unstable categories by any means, and one could organize around some of them. Indeed, we have examples of this in many university institutes (Johnson 1986).

There are a number of difficulties one faces in doing subject matter research in agriculture and rural topics. Once organized, departments can become rigidities that impede cooperation needed to address new, less stable subject matters and problems. Also over time the relevance of the disciplines that are combined in a subject matter department shift and the composition of the department grows obsolete. This is a significant question in the case of some departments in colleges of agriculture today. There is as well a lack of organizational capacity at the college and experiment station level, indeed, at the university level, to deal with the administrative complexity involved in managing subject matter research efforts. In addition, the reward system for tenured professors is such that it too can be an obstacle to cooperation -- as we all know. Other obstacles arise out of the low regard with which subject matter agricultural research, extension, public service, etc., is held in the eyes of many university provosts and vice presidents for research, as well in the National Science Foundation, The National Academy of Sciences and often the rest of the university faculty. In addition, there are important constraints on subject matter research, teaching, extension, advising and consulting, etc. that occur when disciplinary knowledge is not available to address problems in the rural social sciences, as well as in the biological and physical sciences in agriculture. This in turn is an opportunity for building linkages to the appropriate disciplines and in assuring that the human capital in a subject matter organization, such as the college of agriculture, is well trained in the necessary basic disciplines (Johnson 1986).

Disciplinary Domains and Responsibilities

Disciplinary research and is absolutely essential for the rural social sciences to be effective. In economics, for example, you need strong disciplinary input in economic theory and in the ancillary disciplines that sustain that theory, in statistics and quantitative methods, and in data collection and in philosophy for epistemology and philosophic value theory. In addition, inputs from other basic social science disciplines are necessary in many cases before an applied issue can be researched properly: thus one needs sociologists, anthropologists, historians and so on. The attempt to apply disciplinary knowledge is constrained when the disciplinary knowledge relevant to the subject or problem is not available or has not yet been developed. This is true whether you are talking about a discipline in the social sciences or the humanities or, indeed, in the biological and physical sciences.

It is important to understand that there is a big difference between applied sociology or applied economics and multidisciplinary work. If all you do is apply economic theory to a rural problem, you are not doing multidisciplinary work. You are simply applying your discipline. In most cases you will not be dealing with the whole of the problem, nor providing the analysis upon which adequate problem resolution is possible. One cannot rest with the effort in applying a discipline. One must still work in cooperation with the other relevant disciplines, if problems are to be addressed

adequately. Thus, disciplinary responsibility involves not just research, but teaching, consulting and administrative effort in support of other disciplines. These responsibilities are often depreciated and ignored, eroding the social relevance and value of the discipline.

Problem Solving Domains and Responsibilities

The purpose of problem solving knowledge is to create a prescription to solve a problem. In problem solving the task is to generate prescriptive knowledge. Prescription involves value free knowledge, value knowledge, plus some decision rule which together allows you to make a "should" or "ought" statement about how to deal with the problem at hand. Problems are inherently unstable. Thus, it is not possible to organize stable administrative structures around problems. That is to say, you cannot organize around a problem and expect that organization will have relevance and value for some indefinite period of time, such as two or six decades. Problem solving requires both value free knowledge and knowledge about values concerning technology, institutions, human capital and the natural resource base of society. When one speaks about knowledge of values, one is not only talking about monetary but also nonmonetary, intrinsic and extrinsic values. Problem solving involves both public and private input, which are usually highly complementary. Many such inputs are absolutely essential complements, in spite all of the antagonism and idealogical nonsense that we hear today about public vs private roles (Johnson 1986).

Problem solving is very complex, specific and demanding. Teaching it is extremely difficult. Much has to be learned by doing. The most effective problem solving is done by those with the problem and by specialized private sector consulting/advising organizations -- the "beltway bandits" of the world. Universities are poorly suited for this, as a rule. There are heavy administrative requirements for managing problem solving research. In a university one generally needs to have administrative and budgetary input beyond the department at the college and the university level. In international programs this extends beyond the university to national and international agencies and foundations. Many colleges and universities lack the capability and commitment for managing effectively any major problem solving. Universities are often viewed with suspicion by the private sector and many public officials. As a consequence the university is not looked to for help on problems, even where its knowledge base is relevant.

As a result of the instability of problem solving knowledge and any attempt to organize around problems, those organizations that do problem solving are generally structured along subject matter lines; which tends to be substantially more stable while at the same time being reasonably relevant when organized properly. Since the core of the university is organized by discipline, when multidisciplinary needs arise and opportunities for service to society are offered (or demanded) there is normally a lack of administrative flexibility and capacity in the university to address such needs. However, professional schools and institutes are generally subject matter organizations and were created to serve society in its problem solving. Thus, one may look at subject matter knowledge and its organization as a necessary bridge between the disciplines and capacity for problem solving.

The interdependence between disciplines and problem solving is palpable. In this workshop, we need the disciplinarians to identify relevant disciplinary knowledge that is not being exploited by the rural social sciences today. But we also need a dialogue that runs in the other direction. The rural social scientists, who work on problems, must identify disciplinary knowledge that is necessary but does not now exist. In other words,

we need to identify any deficiencies in the basic disciplines that must be repaired before it will be possible to address specific problems. We need a two way dialogue in our workshop between the rural social sciences and the basic disciplines. Both types of knowledge should be on our priority list. This is not limited just to the relationships between the applied and basic social sciences. We also must identify any biological and physical science disciplinary knowledge needed in addressing specific problems that are not now available.

Finally let me come back to what I consider to be a primary theme. We must learn to work together better. This need runs well beyond the land grant system. We have had for a century an organizational structure that has proved quite adequate -- called the land grant - USDA system. Up until World War II about 90% of all the research resources in the biological sciences were found within that system. A somewhat lower but still very high percent of all U.S. social science resources devoted to agricultural and rural topics were to be found within this system. This has changed.

As the problems have changed so have the relevant disciplines. Today some of the social science disciplines needed to address problems of rural and agricultural life are not found within the land grant colleges of agriculture. Those social sciences that are present in the colleges are often not well integrated into college programs and priorities. And some unknown but significant part of the social science research on agriculture and rural life today is not found within the land grant system proper. For research and information purposes we need a collegial network that reaches well beyond the USDA - land grant system. We need to explore new forms of communication, funding and decision making. We need new strategies. There is little or no chance of founding new departments for each of the social sciences within colleges of agriculture. The overhead costs would be prohibitive relative to the demand. However, their input is still needed. We must find ways of communicating and funding through various kinds of networks and decision systems that will allow us to organize to address problems as they arise. We need it to improve the social relevance and the capabilities of the social science disciplines themselves.

The original idea for this workshop came from within the land grant - USDA system. It represents a reaching out to colleagues in search of that larger community of scholarly interest and concern which we know exists. We must mobilize that community, if there is to be an effective and coherent social science response to the changing agenda of problems in agriculture and rural life. That is our challenge. It will be difficult. But with energy, good will and commitment to a larger vision of the role of the social sciences and humanities in agriculture and rural life, it can be done.

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